The REFINER AND NATURAL GASOLINE MANUFACTURER

One of the latest Jenkins installation—Operating on Topped Crude

"Jenkins has the flexibility to produce only liquid products of marketable specifications from a wide range of charging stocks."

~ REFINERY DIVISION ~

Founded 1857

GRAVER Corporation

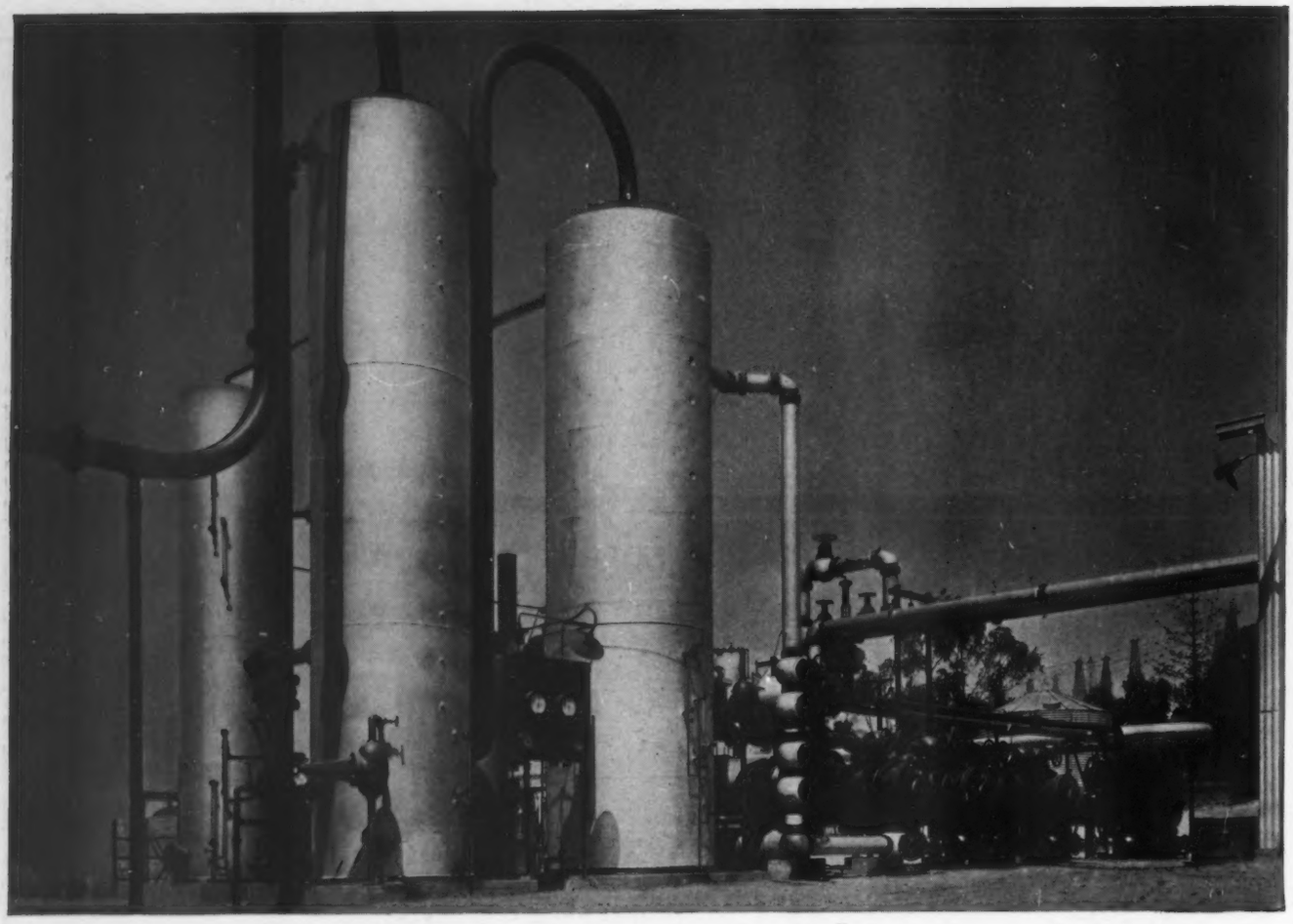
844 Rush Street ~ Chicago

NEW YORK FORT WORTH LOS ANGELES

Plant --- East Chicago, Indiana

BRAUN

DISTILLATION UNIT



Braun Distallation Unit showing still, rectifier, preheaters, heat exchangers and oil coolers.

Oil Circulation
550,000 gals. per 24 hrs.

C·F·BRAUN & CO.
Manufacturing Mechanical Engineers
ALHAMBRA, CALIFORNIA
TULSA Kennedy Bldg. **DALLAS** Republic Bank Bldg. **HOUSTON** Neils Esperson Bldg. **CHICAGO** Engineering Bldg. **NEW YORK** 120 Broadway

Entered as second class matter June 16th, 1923, at the Postoffice at Houston, Texas, Under the act of Ma rch 3, 1879

A Gulf Publishing Company Publication

THE REFINER

and Natural Gasoline Manufacturer

Member Audit Bureau of Circulations

Vol. 8, No. 2

FEBRUARY, 1929

GRADY TRIPLETT, *Editor*

GEORGE REID, *Associate Editor*

TABLE OF CONTENTS

Industry's Programs Do Not Appeal to Majorities 55
An Editorial by Grady Triplett

Natural Gasoline Outlook Brighter 57
By H. J. Struth

Special Processing of Coking Crudes 59
By George W. Cupit, Jr.

High Pressure Fractionation Responsible for Liquefied Petroleum Gas 63
By George Reid

Rowesy Flashing System Employed at Pampa Refinery 65
By George Reid

Stack Heat Utilized in Steam Generation at Emery Plant 68
By George Reid

Practical Design and Operation of High Pressure Fractionating Columns ... 71
By E. R. Cox

Survey of California Gasoline Plants 73

Coltexo Plants Have Advantage of Rich Panhandle Gas 76
By George Reid

Trinidad Would Encourge Establishment of Refineries 83
By Roy E. Leigh

Smokeless Carbon Black Process Operating 87

Number Two Pennzoil Plant Offers Modern Equipment 88
By George Reid

Accident Statistics—Their Value and How to Use Them 100
By W. Graham Cole

Heat Transfer in Ammonia Condensers 102

New Equipment 110

Abstracts of Technical Literature 113

EDITED MONTHLY AT TULSA, OKLAHOMA
Copyright, 1929

Published Monthly
by
GULF PUBLISHING COMPANY
OFFICE OF PUBLICATION
3301 Buffalo Drive, Houston, Texas

R. L. DUDLEY, *President*
A. L. BURNS, *Gen'l Manager*
SPENCER W. ROBINSON, *Editorial Director*
J. KENT RIDLEY, *Managing Editor*

NEW YORK: Room 408-409, 250 Park Avenue, R. P. Swinsky, Manager.

PITTSBURGH: 510 Park Bldg., W. W. Pigue, Manager.

CHICAGO: Room 520, 624 S. Michigan Ave., O. R. Waller, Manager.

LOS ANGELES: 416-417 Haas Bldg., Wm. V. Gross, Manager.

TULSA: 913-916 Hunt Bldg., J. F. Carter, Jr., Manager.

FORT WORTH: 203 W. T. Waggoner Bldg., H. H. King, Manager.

Single copies 20 cents. Domestic and Foreign subscription price, $1.00 a year. Advertising rates on application.

DU PONT ANNOUNCES

a paint made especially for the petroleum industry— "general purpose" in scope

Petro Paint is highly resistant to sulphur fumes—adapted for systems for all types of surfaces

THE petroleum industry has maintenance battles to fight unknown in any other field. On leasehold property, tanks, refineries, pumping stations—for a host of uses in transportation and marketing equipment, ordinary paints cannot stand the gaff. They blacken—become unsightly—everywhere soon deteriorate.

Now du Pont offers a line of paints scientifically made to solve just these problems—to meet economically your special requirements in beautifying and preserving your property. Petro Paint is a "special purpose" finish of wide adaptability in your industry—not only for wood, but for systems applicable to metal, plaster, concrete—to all types of surfaces.

Du Pont chemists develop remarkable new formula

Paints based on white lead blacken rapidly under sulphur fumes. Lithophone used alone fails by excessive chalking and mildewing. Zinc oxide used alone causes cracking. Eventually, after extensive experiment, du Pont scientists decided on the prime pigment portion of Petro Paint: lithophone, zinc oxide and titanium oxide pigment. Inert pigment was added to give greater durability. Field and laboratory tests determined the proportions to bring out the most desirable features of each element.

A fundamental study of driers was made. A vehicle was developed which overcame many difficulties hitherto unsolved. Ease of brushing was attained. Petro Paint sets a completely new standard for beauty, efficiency and economy.

7 reasons why Petro Paint solves your problems

Consider these characteristics of Petro Paint as applied to your own specific painting problems:

1. Petro Paint is highly resistant to sulphur fumes and aqueous vapors.
2. It is adapted for systems designed for all types of surfaces.
3. On tanks it curtails evaporation. It has the remarkable quality of retaining its original brilliance and cleanliness for a long period of time without fading.
4. It has greater durability under any conditions.
5. It leaves a good surface for repainting.
6. It can be applied under adverse temperature conditions. It does not crawl on cold surfaces.
7. It hides better than other mixed paints—is very economical.

Petro Paint gives you an opportunity to use *color* effectively wherever you wish.

Send for further information

If you will send the attached coupon or write on your business letterhead, we will send you our Technical Bulletin No. 4 and full data about the Petro Paint line. Du Pont technical men are always available to study your specific finishing problems.

Mail this coupon

E. I. du Pont de Nemours & Co., Inc.
Petroleum Division, Dept. RN-1, Parlin, N. J.

Send me your Technical Bulletin No. 4 and further data about Petro Paint as applied to my problem.

Name .....

Firm ..... Position .....

Address .....

DU PONT
REG. U.S. PAT. OFF.

PETRO PAINTS

Industry's Programs Do Not Appeal to Majorities

IT is apparent that no program of rectifying harmful practices in the petroleum industry has yet drawn a substantial majority to its support. On the other hand, it would seem, although no actual figures are available, that the several programs are laboring with the support of minorities.

Until the Federal Trade Commission has passed on the Code of Marketing Practice its standing can not be fixed. But lack of interest in the code justifies the conclusion that its support is in the hands of a minority. The code when adopted by the American Petroleum Institute at Chicago had fewer than 200 men to take part in the discussion. This consideration was not confined to Institute membership.

Petroleum jobbers either were opposed to the code or they had so little interest in it that they declined to take part in the deliberations that brought it before the Federal Trade Commission.

In the producing division of the industry, two model bills, prepared at the suggestion of the Secretary of the Interior by a committee of the American Bar Association, have failed to meet approval. Twice mass meetings in Kansas and Oklahoma were postponed. That there was opposition to these measures, which would legalize unit development through state statutes, is no secret.

Even the curtailment programs of the Greater Seminole area and the West Texas territories have been beaten against the rocks of opposition, although this opposition came from a minority of oil producers of these territories.

Men of the petroleum industry are united in their conviction that evil and unprofitable conditions should be changed. It is not the purpose of these efforts which meet opposition; but the machinery so far devised has not met approval.

To the men connected with it, the petroleum industry is a sick patient. Still no commanding majority has yet placed itself in favor of the remedies prescribed for the patient.

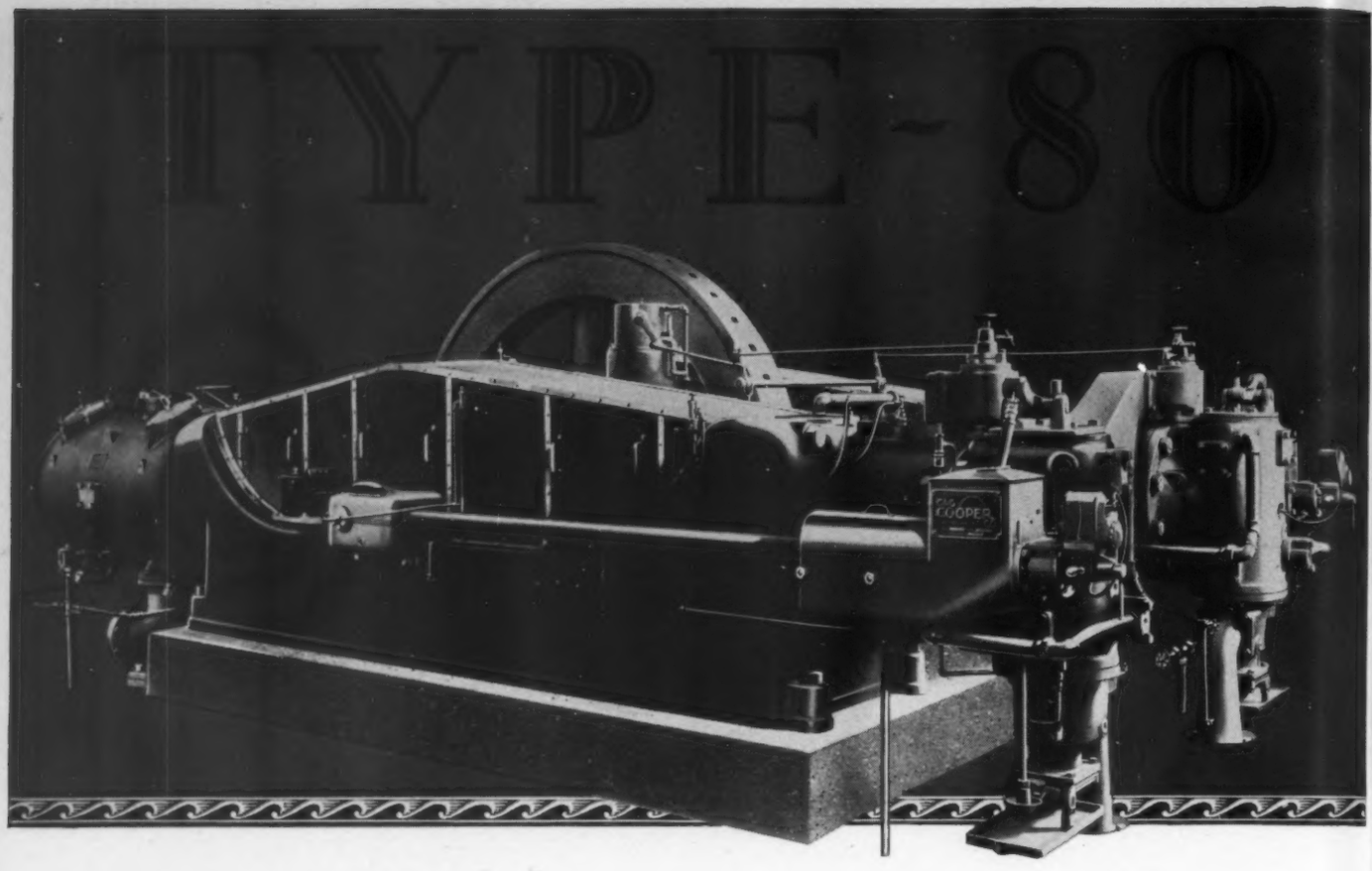
It is evident that distrust exists in the petroleum industry. The men of small holdings are not content with what those of large holdings propose. Independent producers look at the larger companies with fear. The small jobbers do not like what the integrated concerns offer.

The refining industry has less of this distrust than the other major divisions of the industry, although it exists even with refiners.

What happens in the producing division and in the marketing division will have some bearing on the refining field. But this places the burden more firmly with refiners. The refiners of the Mid-Continent and other sections hold the destiny of the petroleum industry more firmly than they have previously held it.

If the output of refineries can be held close to actual consumption of petroleum products, other divisions of the petroleum industry can not seriously hamper progress. If refiners continue to conduct their business properly, other divisions of the industry will in time be forced to adopt corresponding sensible practices.

Grady Gilbert



The 1929 Cooper Type-80 Is a Still Better Gas Engine

Every year the Cooper Type-80 170 H.P. gas engine driven compressor has been improved. A number of refinements in both design and materials have been added which make it a still better value for 1929.

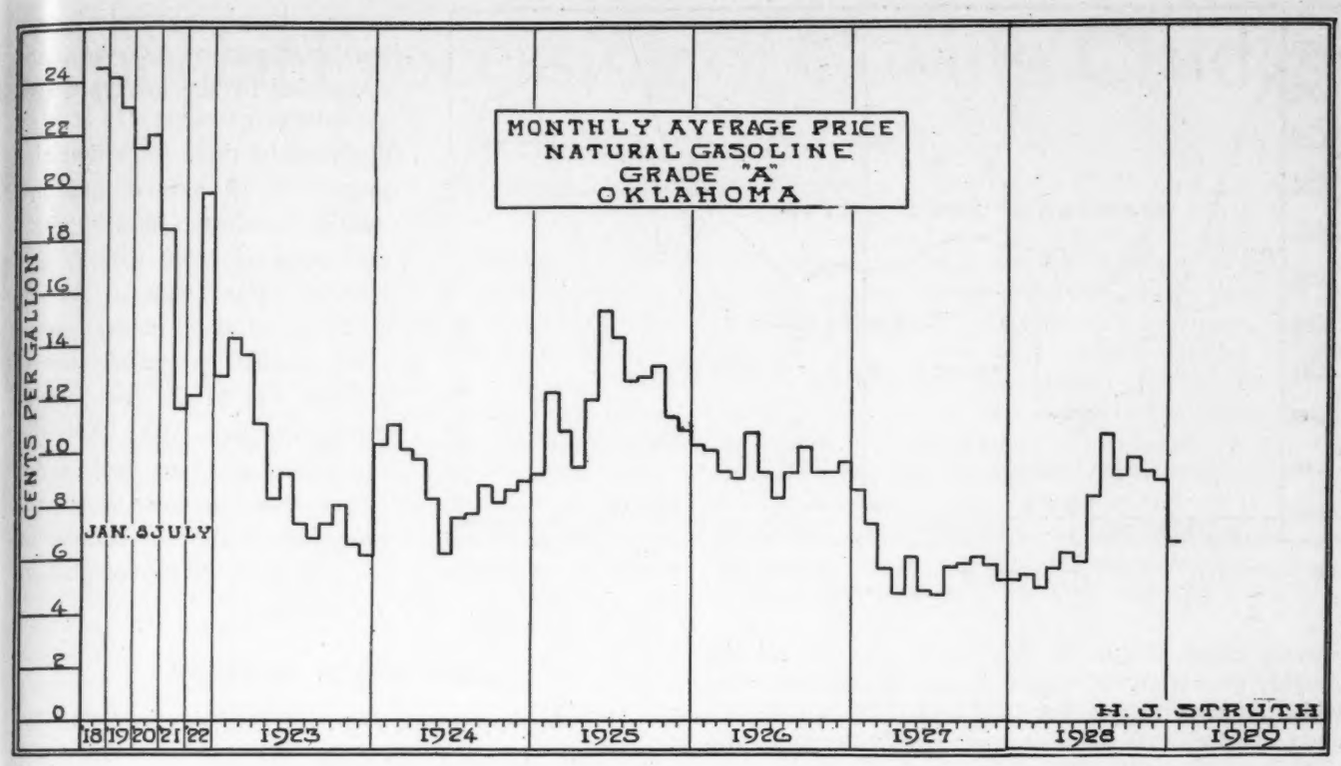
It will always be a four-cycle single-acting engine — simple to install and operate. Compared on the basis of fuel economy, lubricating oil consumption, installation cost, maintenance cost, percentage of hours on the load, and earning capacity, there is nothing to equal it for the service which it meets.

General managers, stockholders, superintendents, operators—no one of them ever regrets his choice of a "Cooper."

The C. & G. Cooper Company, Mt. Vernon, Ohio

1116 Magnolia Bldg., Dallas 615 Kennedy Bldg., Tulsa 649 S. Olive St., Los Angeles

COOPER



Natural Gasoline Outlook Brighter

Expansion in cracking facilities indicates large demand and improved market for 1929

By H. J. STRUTH
Staff Economist

THE improvement in the general gasoline situation last year, as a result of refinery crude runs being somewhat curtailed and the gradual resumption of cracking, created a better demand for natural gasoline at considerably better prices than those which prevailed during 1927. Last year the refineries were successful in reducing their large stocks of gasoline, which was reflected in the upward trend of gasoline prices. The natural gasoline manufacturer is not in a position to exercise the same control over his operations as the refiner, because the demand for natural gas keeps his plants busy regardless of his immediate gasoline situation. However, when the refiner turns his attention to cracking, the demand for natural gasoline automatically becomes accelerated. Cracking operations were more fully utilized last year, which was a material aid to the natural gasoline manufacturer. This year, there is every indication that the refineries will not only more fully utilize existing cracking plants, but will undoubtedly materially expand these facilities. As a result, the natural gasoline manufacturer can confidently anticipate a record-breaking demand for his product, with the assurance that his market will also afford an opportunity for profit.

That the natural gasoline manufacturer has shared the overproduction ills of the petroleum industry is exemplified by the accompanying chart, Figure 1, which portrays the natural gasoline market history from 1918 to date, Grade A, Mid-Continent natural gasoline being used as representative of the general market. The year 1927 was probably the poorest in the history of the industry. The decline in market values of natural gasoline which began in the summer of 1925, continued on its downward course and reached the lowest level ever recorded during the summer of 1927. In April, 1928, the natural gasoline price trend showed unmistakable signs of an upward tendency, which gained momentum and reached its peak during August. From then until the end of the year prices were shaded, but the market foundation was firm until January, 1929. Partly as a result of a sharp increase in gasoline stocks at refineries on the first of the year, and partly on account of an unsatisfactory crude situation, natural gasoline prices receded sharply during January. However, a better demand is being experienced at this time which is exerting a better tone to the market.

PRICE AND SUPPLY—DEMAND RATIO

An interesting fact brought out in this market study is the marked relation between the supply-demand ratio of natural gasoline and its market value. In the accom-

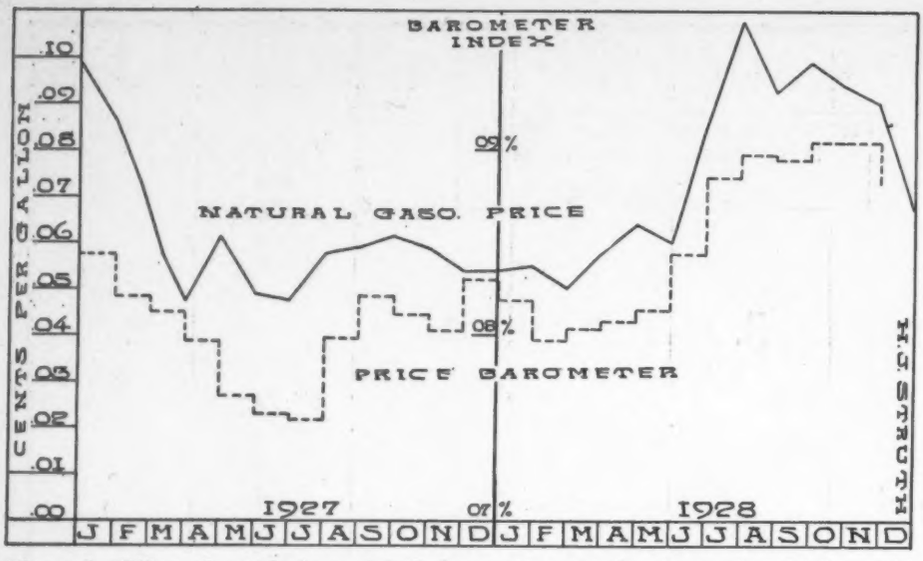


Figure 2—Effect of supply-demand ratio barometer upon the course of natural gasoline market prices

panying chart, Figure 2, the writer has plotted the monthly price trend of Grade A natural gasoline in the Mid-Continent district, for 1927 and 1928, in comparison with the price barometer, or supply-demand ratio of that product. It will be noted that the price curve closely follows the direction indicated by the barometer, proving that the economic laws of supply and demand exert an absolute control over the price swings of the natural gasoline market. On the other hand, however, the natural gasoline industry is primarily dependent upon the course of refinery operations. Obviously, therefore, when the refiner expands his cracking facilities, the natural gasoline manufacturer benefits from the accelerated demand for his product. Thus, when refinery cracking operations are curtailed, as was the case during 1927, 1926 and part of 1925, the necessary annual increased output of natural gasoline becomes an unwieldy burden and results in a depressed market.

It has also been apparent for some time that the refining industry, through improved methods of distillation, and through the ability to procure greater amounts of light crude oil, has been able to proportionately reduce the quantity of natural gasoline required to produce the essential qualities of blended motor gasoline. This has also exerted an unfavorable influence upon the natural gasoline market during recent times. However, with definite indications at hand that cracking is on the increase and with many additional cracking units in process of construction and projected for this year, it is a foregone conclusion that the natural gasoline manufacturer faces an unusually good demand during the present year. Figure 3, shows the trend of the output of cracked gasoline and the approximate proportion of natural gasoline used in blending. It will be noted that the output of cracked gasoline turned sharply upward during the latter part of last year, accompanied by the increased use of natural gasoline. It is also disclosed by these facts that the proportion of natural gasoline used in blending is showing further signs of being slightly decreased. For example, during 1927, the ratio of natural gasoline to the total output of cracked gasoline was 31 per cent., while during the past year, 1928, the ratio stood at 29 per cent., a decrease of two per cent., or a proportionate decline in volume of approximately 30 million gallons for the year.

PRODUCTION INCREASE

It is now apparent, from the statistics available for the first 11 months of 1928, that the total output of natural gasoline during last year aggregated approximately 1,760,000,000 gallons, an increase of 133,000,000 gallons over 1927. Since approximately 94 per cent. of all natural gas produced in the country is treated for the recovery of natural gasoline, it follows that the industry treated about 1,496,000,000,000 cubic feet of natural gas, which represents an average recovery of nearly 1.2 gallons per thousand cubic feet of gas treated. At this rate, it is apparent that the total marketed output of natural gas aggregated approximately 1,600,000,000,000 cubic feet during 1928. With the vast program of expansion

(Continued on page 82)

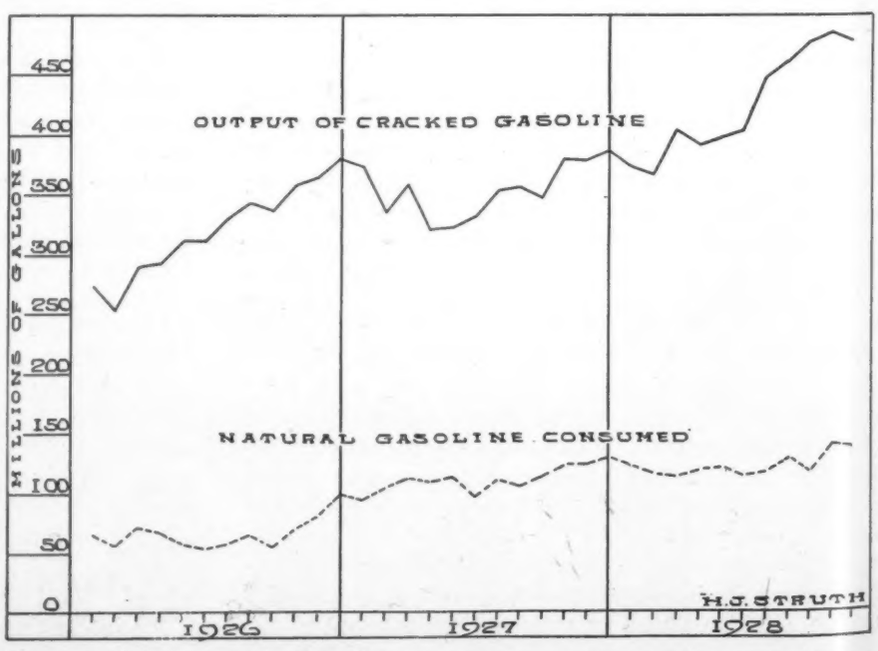


Figure 3—Trend of cracked gasoline output and proportionate natural gasoline content of motor gasoline production

Special Processing of Coking Crudes

By GEORGE W. CUPIT, JR.
Chemical and Refining Engineer

OF all the methods used in processing crude oils for finished products, there is not one which is comparable with the process of running the crude to coke. To many refiners, this statement may appear to be somewhat exaggerated; however, if a thorough analysis is made, one cannot but agreed that the above statement is true. The process of running to coke is exceedingly complex and in the majority of cases is undertaken by only those refineries that manufacture a complete list of petroleum products.

What is the meaning of "running to coke?" Does it mean that the residuum is the product most desired? It does not. As a matter of fact, most refineries find it a rather difficult matter to dispose of the coke. In reality, processing coking crudes is a method whereby the refiner may obtain at a minimum cost the best distillate products the crude is able to yield.

The method of processing the crude oil depends directly upon the distillates desired. In general, the principle of coke running is the same, and I shall describe the method of processing which will yield not only the most desired distillates but likewise the maximum products. The starting point of our plan of processing the crude is the preparation for charging. In this work the standard tower stills will be used. As for the grade of crude to be used in running to coke, any one of the following may be used with success: Mexican, Mid-Continent and Haynesville. We shall use in our method of processing a Mid-Continent crude.

THIS is the first of three articles on this subject. In the next the author will begin with the cut, sour distillate, and continue the process through the consideration of paraffine distillate.

The two remaining sections on the subject will appear in forthcoming issues of THE REFINER AND NATURAL GASOLINE MANUFACTURER.

PREPARATION FOR CHARGING

The still, setting, condensers, and piping must be inspected in the regular way and reported OK as the first step in the process.

Assuming the equipment has been reported OK by the one authorized to make inspections, the following precautionary steps should be taken to safeguard against accident of fire or explosion in charging:

(1) Replace manhole covers on each end of still, making sure that faces of both cover and flange are smooth, using heavy sheet cardboard to make the joint tight. Be sure all bolts are tightly drawn.

(2) Replace manhole covers on top of still, also on tee on vapor line using oil and graphite to keep the gasket in condition. (The same gaskets may be used severad times).

(3) Open clapper valve in vapor line and open safety pop valve on still.

(4) Open low pressure steam line into still for a period of approximately one-half an hour. It is difficult to specify a definite maximum and minimum time for steaming out. Steam should appear issuing in good volume from safety valve before starting to charge. Steaming in reduced volume should be continued during the time oil is charging into still. Generally speaking, the cooler the still the quicker a good volume of condensing steam will appear at safety vent on still. This is to make the atmosphere inside the still incapable of supporting combustion and insure against the charge flashing when it comes in contact with the warm still.

CHARGING

At the end of the steaming out period, open valve on charging line and charge still to specified outage measuring the depth of oil in still through hole in manhole cover nearest charging valve. As the flow of oil from charging line runs at a rate of about 40 barrels a minute, it is obvious that close attention must be paid while charging to avoid getting too much oil into the still. One still is all that a man can safely charge at one time; (steaming of two stills may be done simultaneously) but when the first still is nearly finished charging, the charging of an adjacent still may be begun. When the proper depth of oil in still is shown on measuring stick, close the valve on charging line at header and allow branch line to drain into still. Then close valve on line at still and take wheel off the spindle so as to avoid the possibility of anyone later opening this valve by mistake. Close safety valve on still, shut off steam, screw plug in manhole cover, and order fires lighted under still. Fire and ash pit doors should be left open during time still is being charged.

Fires should be started quickly under still in order to get the distillation started with as little delay as possible. Keep a good fire up to the time when warmth of the vapor lines and pressure developing inside the still (test by lifting weight on pop safety valve) indicate the "over" point of the run is about due. Draft on fires should then be checked and allowed to remain so until the condensate begins to run from light worm to receiving house. After the still has come "over," the fires may be somewhat increased again, and when the appearance of the steam in house indicates that most of the moisture has come "over" from the stills (usually the drying out of the still charge requires about three hours of moderate

firing from the over point), the heat should be increased as much as possible. As refluxing from No. 1 tower begins at this time, there is no danger of getting the fires too hot. In fact it hardly seems possible to advance the heat too rapidly no matter how hard the fires are run. Under good conditions of firing, the rise in still temperature should be about 40 degrees per hour. Increasing the heat at this rate is desirable up to a point where a temperature of about 650 F. is attained in the still (at the time a gravity of 38 F. shows on intermediate worm, and at which time "gassing" begins).

At this point it is not desirable to fire so hard as too intensive firing from this time on is likely to make the still blow and may also have the effect of making the paraffin distillate go off color sooner than it should. Slightly check the firing but attempt to keep increasing the heat at a rate not exceeding 10 degrees an hour, which rate should permit of prolonging the paraffin distillate cut to a time of eight or 10 hours. At the end of the paraffin distillate cut, firing should be increased again with a view of getting the charge off as soon as possible, but toward the finish when coking is being done, excess firing is to be avoided both for reasons of fuel economy, since the fires are to be drawn at the end of the run, and also to avoid burning the still bottom, which can easily be done if a long gassy flame is projected on the still bottom. The aim should be to have fires in such condition that they can be burnt out, and not re-coaled during the last hour of the run.

CUTS ON OVERHEAD CONDENSATE

Keep four-inch run-back from tower to still closed from start of run until all moisture is off of the still charge. Elimination of moisture is judged by decrease in temperature of stream at light worm together with appearance of stream in heavy worm. When moisture is considered all off, slowly open runback valve, at the same time closing the heavy worm valve.

Light worm—Open to house at all times during runs.

Intermediate worm—Open to house when gassing starts (at 39 F. on light worm). At the start of the run and until a gravity of 39 F. is reached on the light worm, the intermediate worm is closed to house. During this time the condensate from intermediate tower is brought through cross-over line into light worm and the stream from light worm represents the condensation of intermediate tower and overhead from that point. The intermediate worm will deliver separately into the receiving house from the time it is opened until the end of the run. At the time intermediate worm is opened to house, the light worm should be connected on the gas compressor system and left on till the end of the run.

Heavy worm—Keep open from start until moisture is all off the charge. As soon as runback to still is opened, close heavy worm and steam it out. Open saucer line to house when gravity of 36 F. is reached on intermediate worm stream. This will serve to wash the dirty colored residue out of the worm by the time the stream is ready to film. When gravity of saucer stream drops to 27 F. or goes off color because of too much heat under still, close saucer line at tower and again open heavy worm to house. Close runback line to still at same time. When gravity of heavy worm stream falls to 12 F., close heavy worm valve at tower and open valve on wax line. Leave this open until the still is coked. Details of cuts made:

Cut	Where Taken off	Specifications
Crude Naphtha	Light Worm	Over to 50 deg. Gravity
Water White Distill.	Light Worm	50 deg. to Gassing (Approx. 39 Grav.)
Gas Oil	Intermediate	Gassing to film
Paraffiin Distill.	Saucer & Inter.	Film to 27 deg. or off color
Paraffin Slop	Heavy & Inter.	(27 deg. or off color to 12 deg. on heavy worm.)
Wax Tailings	Wax line	(12 deg. on heavy to still coked)

The end of the run or formation of coke in still is determined by lifting the safety valve. When no more oil spray is given off and yellow vapors appear, the still is generally considered "coked."

PRECAUTIONS

After the fires are drawn the still should be allowed to stand one hour, after which close the 12-inch clapper valve in the vapor line and steam for two hours.

The stillman, or assistant stillman, should remove the top heads, after which steaming should be continued until all of the yellow vapor and gases have disappeared. The fireman may then remove the side heads.

Before removing the heads, the stills should be poled to determine whether or not they have been properly coked, and when this has been determined the removal of the heads may be gone ahead with.

When opening the side heads, all bolts should be removed except four, i.e., one on each side, one on top and one on bottom. The face of the joint is then broken and if there is no appearance of soft material around the head, the remaining four bolts may be removed. This last should be done by the fireman while the stillman or assistant stillman holds the head in place with an iron bar. After the fireman has safely reached the ground the head may be pulled aside.

After cleaning, inspection of seams of still must be carefully made by a man accustomed to this kind of work. This requires entering the still and sounding out the rivets with a hammer wherever there is any suspicion of looseness in the seams. The inspection of equipment also requires a man to crawl into the furnaces under the still to examine setting for defective brickwork as well as to see if any signs of leakage are to be found on the bottom of the still. If repairs are needed requiring a protracted layover, running lines from the affected still to receiving house (together with gas), must be blanked off (charging and steaming out lines) as a safety measure. Before starting to recharge a still that has been down for repairs, the OK of boiler, brickwork and pipefitting inspectors must first be secured.

GUARDING AGAINST WORM STOPPAGE

The paraffine slop made along toward the end of the run solidifies at comparatively high temperature and special attention must be paid to washing and steaming out the flow lines. The last two or three hours of the run require very little if any condensing water for the light worm. By cutting down the water consumption, the condensing water is kept warm enough to keep the waxes in the heavy and intermediate worms in fluid condition. As soon as flow of oil has ceased through these worms, they should be flushed out with warm water. Following the flushing with water, they should also be steamed out. Again before starting to run a fresh charge, the heavy and intermediate worms should

be tested out with water and if necessary steamed out. In cold weather, even with the observance of these precautions, stoppage of the worms frequently results.

The inspection of lines at end of charge should include ascertaining if vapor lines leading from still to first tower are free of coke. Remove cover from tee on vapor line, removing coke, if any appears, and see that clapper valve is in working order. The condition of run-back line where this enters still as well as the charging line inside still should be specially inspected to insure against stoppage with coke from preceding run.

Each of the above cuts has its special method of processing before it may be termed a finished product. Since we are directly interested with all the cuts made on the tower still, I shall take each one individually, beginning with crude naphtha and process the fraction right to the finished product or products.

CRUDE NAPHTHA—CUT ONE

It should be remembered that this fraction was made on the light worm from over to 50 Be gravity. It represents aprpoximately 17 per cent. of the crude oil run to coke. On account of the comparatively high gravity of this fraction, it is necessary to process it in a closed system. Otherwise, the loss would be too great in the continued steps of refining.

The next step in the refining of this oil is that of sweetening and this is done continuously. The number of agitators necessary to do the sweetening is dependent upon the amount of oil to be sweetened. As a rule three and sometimes four are used which are so arranged as to allow the oil to by-pass any one or two of the agitators. This is done in case it is necessary to make repairs. The re-agent used in the sweetening process is doctor's solution (sodium plumbite). The reagent is added to the oil with agitation and together with the oil is pumped into the second agitator and blown until a sample of the treated oil gives a positive test, or, in other words, is sweet to the doctor. It is then allowed to settle whence the lead sulphide (black strap) settles out and is removed from the bottom of the settling tank. This process causes a loss of approximately one-half of one per cent.

REDISTILLATION

The redistillation of the sweetened crude naphtha is accomplished by the use of the standard type of steam still. The construction and operation of this still are so well known and so universally adopted by the refineries throughout the country that I shall not at this writing take up the time to go into their description. This process, like the above, is one of continuous operation. The stillman in charge of this work should have a thorough knowledge of light oil running in order that he may make just as close cuts as is possible. The closer the fractionating the less rerunning will be required. This should be kept in mind because, as we shall soon see, it is possible to make five finished overhead cuts by this process of distillation. The method of cutting is as follows:

Cut No. 1—86° Be Naphtha	
Cut No. 2—70-72° Be Naphtha	12.0% yield
Cut No. 3—62-63.5° Be Naphtha (Extraction Naphtha)	12.0% yield
Cut No. 4—55-61.0° Be Naphtha (Export Naphtha)	20.0% yield
Cut No. 5—54.5-57° Be Naphtha (Varnish Markers and Painter's—V. M. & P.)	12.0% yield
Residuum—No. 6—Water White Stock (for rerunning	43.0% yield
Loss	1.0%

The first five cuts may be sold as finished products provided they meet the following distillation tests:

Cut No.	Over Point °F	Dry Point °F	50% over @ °F
1 86° Be Naphtha	70/80	205/230	130
2 79-72° Be Naphtha	100/125	305/320	194
3 62-k3.50 Be Naphtha	176/182	325/338	38%@212°
4 55.0-61.0 Be Naphtha	180/186	340/390	
5 54.5-57.0 Be Naphtha	203/215	410	

If the overhead cuts meet the above distillation tests, they may be considered finished products provided their color is 25 Saybolt and remains water white color. All of the above oils are well known and are sold on the market as standard products. So far, the methods of refining have not been very complex. The next step in this work is that of disposing of the water white stock.

PROCESSING WATER WHITE STOCK

This process is different from either of the above distillations in that it is carried out in a fractionating tower still. The height of the tower used for the redistillation should be about 15 to 18 feet and the tower should be filled with perforated tile cylinders approximately four inches in diameter, and four inches in height. In this case, both fire and steam are used in the fractionation which is again a continuous process. From this charging stock, namely water white stock, we can obtain a varied group of products. The first overhead cut which we obtain by a relatively close cutting is blend naphtha. This fraction was so called, no doubt, on account of its blending qualities. The over point of blend naphtha should be not higher than 266 F. and its dry point should be not higher than 437 F. The percentages over at 374 F. and 410 F. should be approximately 58 and 80 respectively. The temperature range covered during the fractionation of this cut lies between 374-410 F., and the gravity of that cut will be approximately 44.7 Be. As a general rule, a good blend naphtha cut will be obtained if the vapors are subjected to a scrubber and allowed to be condensed by means of water spray, then run to a separator, from thence to the receiving house and finally to a storage tank for further motor fuel blending.

The next overhead cut made from the fractionation of water white stock is safety solvent. The gravity of this oil should be between 49.5 and 51 Beaume. A great deal of this oil is sold on account of its solvent properties. On account of its gravity it has a low over point and likewise a low dry point. The former should range from 290 to 310 F. and the latter should be not higher than 410 F. In many cases it is unnecessary to acid treat safety solvent. It is necessary, however, to sweeten it with a dilute solution of caustic followed by a thorough washing or with a small quantity of doctor's solution. The amount of the latter used should be predetermined by making a test on a liter sample of the batch to be sweetened. If it is desired to make as much V. M. & P. naphtha as possible, the safety solvent fraction may be rerun in a batch steam still. It is possible to make on this rerunning an excellent safety solvent together with approximately 35 per cent. of water white stock. The rerunning depends upon the demand for the products.

The next fraction in which we are particularly interested and which may be termed cut No. 3 from water white stock running is—long time burning water white distillate. It is possible to make two grades, one termed light water white distillate with a gravity of 44.5-45.5 Beaume and the other termed heavy water white distillate having a Beaume gravity of 41.5-42.5 degrees. It

will be unnecessary to describe individually the next step in processing of the two long time burning cuts since the same treatment is given each one. After the distillate has stood sufficiently to allow all the water to settle out and the water drawn off, it is ready for acid treating. The oil is charged to the acid treating agitator to the height desired and the temperature of oil noted. The oil is next agitated by means of air and while agitating the acid is either blown or pumped onto the oil. The amount of oil required to do the necessary treating is four carboys of 66 Be. 93.5 per cent. sulphuric acid per 100 barrels of oil treated. The degree of agitation determines to a large extent the time required to blow the mixture. On an average 30 minutes are sufficient. After this time the contents of the agitator are allowed to settle one to two hours at which time all the sludge and acid will have settled to the bottom. The acid sludge is removed either by pumping or drawing down by gravity into an acid kettle for further processing. The oil in the agitator is allowed to settle 30 minutes longer and is then stripped of the last traces of acid sludge.

Neutralization of the sour oil is done by means of a one per cent. solution of Caustic Soda (NaOH) using five per cent. excess of the neutralizing agent (determined by titration of the sour oil). After the oil is neutralized, using air agitation, it is allowed to stand until all soaps have settled to the bottom of the agitator, then drawn off and discarded. The oil is then washed with approximately 30 per cent. by volume with water, allowed to settle one hour and wash water drawn off to sewer. The oil at this point of refining is ready for redistillation.

This process is done by means of a fractionating still admitting steam at approximately 460-480 F. in sufficient quantity to keep the vapors moving and to prevent cracking. The gas cut or, in other words, all the overhead is discarded up to 374 F. Between 374 and 536 F. the fraction will represent the real water white distillate which we are seeking. By the use of a well-designed fractionating tower a very close and desirable cut can be obtained. The desired cut will have the following specifications: Gravity 41.8 Be.; color N. P. A. 3/4; Botz—13.0 per cent.; Assay distillation—over 374 F., dry at 545 F.; 86 per cent. over at 500 F. and 97 per cent over at 536 F. The viscosity will be about 505 at 60 F. Saybolt. The distillate prepared by the above method and possessing the above tests is now ready for sweetening with doctor solution. It is charged to an agitator and blown with air. During agitation five per cent. of sodium plumbite solution is added until thorough washing is brought about. The average time for blowing is from 30 to 40 minutes. At the end of this time the contents of the agitator are allowed to settle one hour at which time the spent doctor solution (PbS), is drawn off and retained for further recovery.

FILTERING

The last step in the processing of this oil is filtering and in this case No. 1 clay is invariably used. The filter used is the ordinary gravity filter which is charged with No. 1 clay to within two feet of the top of the filter. Care should be taken not to allow channeling and once the filter has been saturated with oil, the top of the clay should not at any time be allowed to become dry for the want of oil. If such be the case, the filter will not become air pocketed during filtration. The color to which the oil is filtered depends upon the use to which it is put. Some buyers are satisfied if the color of the oil is +20 Saybolt, others buy it without hesitancy if the color is +18, others desire that it should be water white.

The burning qualities are, in reality, the deciding factors. A good oil should not leave any deposit on the chimney. The wick should have little or no incrustation. If a crust is deposited on wick it should be soft and not caked and should be evenly formed. The fibre should not be weakened to any degree and should never be completely destroyed. The flame should not be distorted and should not throw a drop of more than one-fourth-inch during the burning time. The formation of toad stools on the wick is a very bad indication of the burning qualities of the oil. An oil prepared by the above method should meet the following tests:

Beaume gravity	42.0
Color (Saybolt)	+16, +18, +20 as desired
Botz Test	12.0 per cent.
Flash Test	150
Viscosity at 60 F.	460
Picric Acid Test	.65
Sulphur Test	.08

It should be remembered, however, that the resulting tests will vary according to the grade of stock used. Some grades of oils made by the above method have given as high as 54-56 hours burning test with excellent burning qualities as well as good wick and chimney tests. Other grades have had to be mixed with varying amounts of blend naphtha in order to bring the burning qualities up to standard specifications. The approximate yield of long time burning oil of this grade will be from 10 to 14 per cent.

FURNACE OIL CUT

The next fraction obtained in the distillation of water white stock is a cut made between 38 and 42 Beaume called furnace oil distillate. This is known as furnace oil—grade "A." A heavier cut depending upon its use is often made between 36 and 40 Be. which may be termed furnace oil—grade "B." There are other grades of furnace oil made depending upon certain specifications required by the market. Some of these are as follows and have certain tests they must meet:

Gravity	36.5-38.5°	Gravity	30-36°
Flash P. M.	150	Flash P. M.	155
Over Point	372	Over Point	378
Dry Point	540-555	Dry Point	560
Per cent over at 392	6.0	Per cent. Sulphur	0.25
Per cent over at 500	90.0	Per cent. over at 392	4-4.5
Per cent over at 460	50.0	Per cent. at 500	88.0

Before grade "A" may be called a finished product it must go through a washing process with caustic soda (NaOH). This is carried out by charging the distillate to a wash agitator, agitating by means of air and pumping a three-five per cent solution of caustic soda onto the oil. If the oil does not give a positive test for

alkalinity after blowing 45 minutes, more alkali is added until a sample when tested with phenolphthalein, as indicator, gives a slight pink color. The color must remain permanent. When the test gives a slight alkaline reaction, the contents of the agitator are allowed to stand for three hours, the wash water is drawn off and the oil brightened by means of air agitation. When bright, it is pumped to storage as a finished product.

The last fraction made from the distillation of water white stock is gas oil (pressure still charging stock). This has certain tests it is required to meet before it can be used in the high pressure stills. Those requirements are as follows:

Gravity	30-32°
Over Point	374° F.
Per cent over at 392	1.-1.5
Per cent. over at 500	32.-33.
Per cent over at 550	50.0
Per cent. Sulphur	.72

There are so many fractions not yet mentioned that produce a gas oil cut (fit for pressure still charging) that I shall, in the course of writing, add them all together and shall discuss the processing as one topic.

High Pressure Fractionation Responsible for Liquid Petroleum Gas

By GEORGE REID
Associate Editor

ALTHOUGH the experimental work in the perfection of high pressure fractionating equipment was carried out at the Skelly Oil Company, Schafer ranch plant near Pampa, Texas, and "Skelgas" was first manufactured there, the present installation for the manufacture of "Skelgas" is operating at the company's Lyman, Oklahoma, plant. The chief reason for the change is that Skelly Oil Company's north central Oklahoma plant is much closer to the marketing facilities provided by the company at such points as Kansas City, Minneapolis, Milwaukee, Omaha, and Des Moines. In addition, the liquefied petroleum fractions which constitute the bottled "Skelgas," are secured from the richer Oklahoma gas sweet and non-corrosive, requiring no chemical treatment.

At the time of the writer's visit at Lyman, the gasoline plant and the high pressure fractionating plant were producing grade AA gasoline and "Skelgas." The fractionating plant was designed for great flexibility so that the operators may produce whatever grades of natural gasoline, "Skelgas," or airplane motor fuel that may be required. Since the high pressure fractionating plant operates independently of the gasoline absorption plant equipment, any interruption in operation of the fractionator does not influence operation of the natural gasoline plant proper.

The Lyman gasoline plant is provided with a recompressor system for the purpose of producing gasoline from the tail gases from the absorption plant distillation system, and storage tanks. This recompressor gasoline and the absorption plant production is charged to a horizontal steel tank near the high pressure fractionating equipment. From this accumulator the gasoline is charged into the first tower of the fractionator. Leaving the tank it is pumped through the heat exchanger equipment of the tubular type where it is preheated by means of countercurrent flow against the hot liquid being withdrawn from the bottom of the first column. This pre-heat temperature ranges around 200 F. After preheating the gasoline is conducted to the first tower to enter it at any one of four points of entry provided by the design, where it flows over one of the bubble plates.

At this temperature a large portion of the gasoline is vaporized and ascends the tower through the bubble plates above the point of insertion. The unvaporized portion flows downward over bubble trays to the bottom of the tower and into the reboiler section. This section of the tower is maintained at a constant temperature by injection of steam—usually 310 to 320 F. Temperatures, of course, must vary in accordince with the type of material being produced. Any vapors evolved while the gasoline is in the reboiler section are reintroduced into the tower at a point below the first bubble plate and pass upward through the tower countercurrent to the descending unvaporized gasoline.

PRESSURE CONSTANT

That portion of the gasoline which is not vaporized in the reboiler section passes outward through the heat exchanger equipment previously mentioned where it serves to preheat the raw gasoline charged to the unit. Leaving the exchangers it passes through the cooler equipment (tubular water cooled type) where its temperature is reduced to around 80 F., and thence to storage. An automatic liquid level controller governs the rate at which the gasoline is withdrawn from the reboiler section. After the gasoline is cooled the pressure is released. The pressure under which the system operates is maintained constant in all exchanger, cooler, reboiler and tower equipment. The temperature varies throughout the equipment to suit the type of products yielded.

The vaporized portion of the gasoline charged to the first tower passes out at the top of the column through a reflux condenser of the tubular, water cooled type, from which any condensate accumulating is conducted back into the tower, flowing into and over the uppermost bubble tray, and then downward through the tower.

Vapors leaving the first tower are conducted into the second fractionator which is also provided with four points of entry. The point of injection depends upon the type of material being prepared.

Second tower operation is similar to the first. The tower has a reboiler section at the bottom which is maintained at sufficient temperature to cause the vaporization of any liquefied petroleum gases which are entrained in the condensate flowing downward through the tower, and returns them to the tower at the bottom plate.

Liquid level control equipment also governs the rate at which condensate leaves the reboiler section, as in the case of the first tower. The hot condensate passes through cooling equipment and its temperature is also reduced to about 80 F. Temperatures at this point are varied in accordance with the method of operation. The equipment is sufficiently flexible that three grades of gasoline may be produced, and Grade AA may be withdrawn from the bottom of the first tower, for example, Grade BB from the second column and "Skelgas" removed from the top of the second fractionating columns. Gasoline which is butane free may be produced, along with practically pure butane and "Skelgas." The equipment is so designed that practically any desired grade of gasoline may be made at the plant, and at the same time the production of "Skelgas" is carried on. In this second tower, practically all of the liquid portions of the gasoline charged to the unit is fractionated out, leaving only the pure "Skelgas" to be removed from the top of the tower.

AUTOMATIC OPERATION SOUGHT

Passing from the top of the tower the gases are taken through a reflux condenser, as are the vapors from the first tower. Small amounts of condensate are removed in this reflux condenser and are tapped back to the uppermost bubble plate in the tower. Leaving the reflux condenser the vapors pass through a series of coolers where the material is cooled. The finished "Skelgas" is stored under pressure sufficient to hold it in the liquid state. Finally it finds its way to market either in steel drums or in specially designed tank cars.

In the design and construction of this type of high pressure fractionating equipment, Emby Kaye, general superintendent of the natural gasoline department of Skelly Oil Cocmpany, and his associates, have made every effort to secure the desired flexibility of the units, to make them practically automatic in their operation, and to provide a wide margin of safety for the operators. At the Lyman plant the high pressure fractionating equipment is located adjacent to the Oil Froth type of absorber, in the heart of the plant, so that no additional labor is required as the result of the installation and operation of the "Skelgas" manufacturing equipment.

Standard steel drums are used mostly for the transportation of the liquified petroleum gas, but the Skelly Oil Company has developed a new and different type of valve for use on the containers. The valve device is so designed that when a drum is being loaded and reaches the predetermined desired level a small stream of the product is ejected from the relief vent through which the drum is vented while being filled with "Skelgas." This arrangement is used for the purpose of insuring the proper outage in the drums, which must be left to take care of expansion of the product during shipment. The valve is also equipped with a fracture disc as an additional safety feature to the soft metal fusion plugs provided in the steel drums. As a check on the loading procedure, all of the loaded cylinders are carefully weighed and the net weight of the liquid placed in the cylinder is noted. This net weight must not exceed 44 per cent. of the weight of water occupying the capacity of the drum. This system was devised as a convenient means of specifying maximum loading capacities of the cylinders. The loaded cylinders are shipped in box cars into the various districts where the company has established outlets.

Carbon Monoxide Eliminated From Gas Fumes

After eleven years of research and experimenting, C. Howard Williams, of Downers Grove, Illinois, has perfected a chemical treatment for gasoline which neutralizes the deadly fumes of carbon monoxide that come from the exhaust of an automobile, which endangers life when the motor is running, if only for a few minutes, in a closed garage. A number of deaths are reported every winter season from this cause, and persons who find it necessary to travel long distances by automobile during the winter months, often complain of a sleepiness which is usually due to carbon monoxide fumes coming up through the heaters in their cars. Undoubtedly this drowsiness is a contributing cause to the innumerable road accidents which seemingly have no other explanation.

White rats or Guinea pigs are used by Mr. Williams for demonstration purposes. During a recent demonstration a white rat remained for 40 minutes, without apparent ill effects, in an airtight cabinet, into which fumes were going from the exhaust of an engine using the neutralized gasoline, although at times the force of the exhaust was sufficient to raise the animal off its feet. Upon being removed from the cabinet, it ran around and ate in a most natural manner.

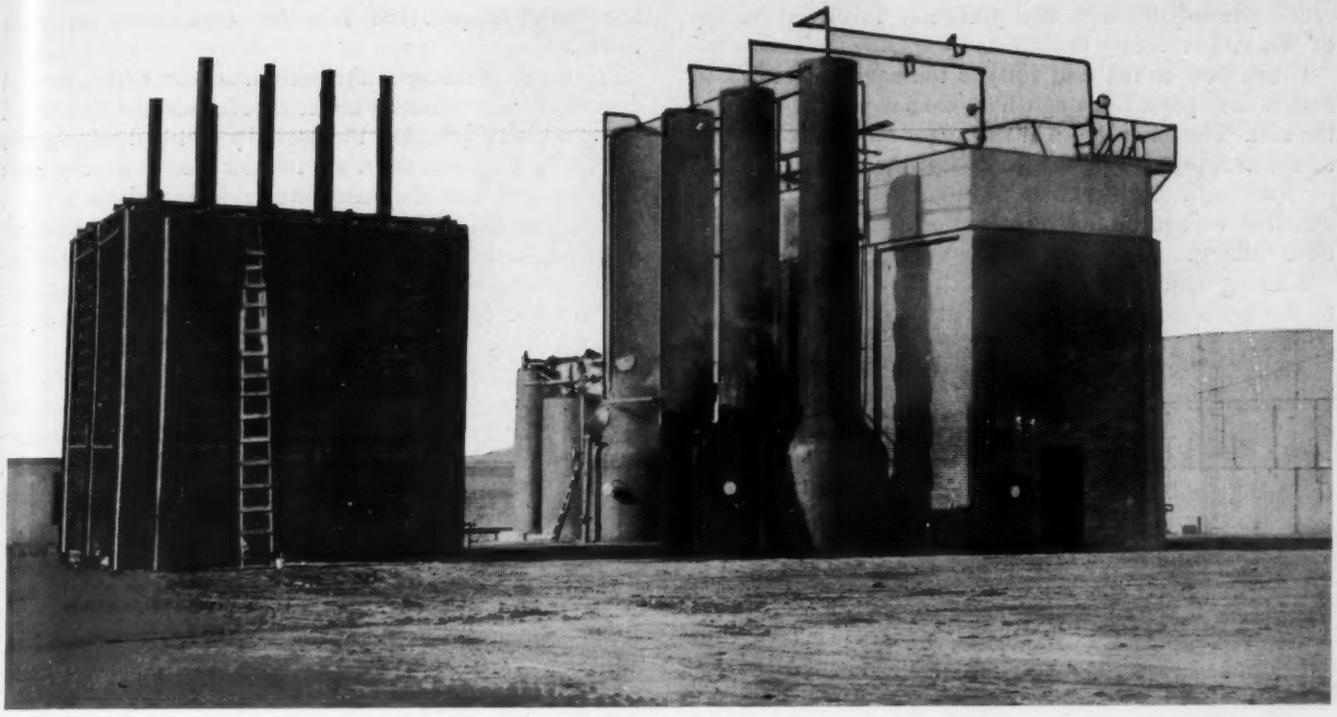
The gasoline in the tank of the engine was then changed to ordinary transportation gasoline obtained at a nearby filling station and another rat placed in the test cabinet. In less than three minutes after the engine was started, the rat was dead.

During a recent demonstration of this neutralized gasoline, Mr. Williams' son remained in his two car garage for over two hours with all doors and windows sealed, while his automobile, using this gasoline was in the garage with the engine running.

Several tests have been made by engineers using this neutralized gasoline in different makes of engines, to compare its power to that of the ordinary transportation gasoline bought at filling stations, and the results showed no loss of power in the "Neutral Gas," as Mr. Williams calls it. In fact, the neutralized gasoline seems to give the engines a little snappier pick-up.

The neutralized gasoline is not injurious to metal in any way. In the laboratory are samples of iron, steel and copper that have been immersed in it for over two years but there are no signs of chemical action on them.

Mr. Williams is well known in oil circles and was an expert on petroleum products for the government during the World War.



Multiple flash Tube still and fractionating column type of refinery with capacity of 3000 barrels per day. Pampa Refining Company, Pampa, Texas

Rowsey Flashing System Employed At Pampa Refinery

By GEORGE REID
Associate Editor

THE 3000-barrel refinery of the Pampa Refining Company was placed in operation in June, 1928. The accompanying photograph of tube still and bubble towers shows something of the small area required for the essential equipment of this type of refinery. The space beneath the condenser boxes is utilized as a pump and control house. In connection with the pumping equipment it may be well to state here that there are not steam-driven pumps, or air compressors, in this plant, as all such equipment is motor-driven. This reduces the steam requirements for the plant to the point where but one small oil field type boiler is required to furnish steam for distillation in the reboiler sections of the four columns. This unit is the first complete installation of the Rowsey process, the second unit, which includes certain features not incorporated in the design of the Pampa plant, being installed at the Great Western Refining Company's plant at Big Spring, Texas. The latter company is controlled by the same group of men interested in the Pampa installation. G. L. Rowsey, formerly of the Amarillo Refining Company, is general superintendent.

MODERN multiple-flash systems for petroleum distillation, although similar to the extent that all of them employ the tube still and bubble type fractionating columns, differ in various installations in the type of mechanical lay-out of still and column and the manner in which crude flows through the units. Five types of multiple-flash installations have been discussed in the preceding issues of The Refiner and Natural Gasoline Manufacturer. The Rowsey system of distillation as employed by the Pampa Refining Company, Pampa, Texas, is discussed at this time. Several other types will be presented in the forthcoming issues of this magazine, as the continuous, multiple-flash, distillation system is rapidly becoming more extensively employed by refiners because of its important features of compact design, ease of control and economy of operation.

TUBE BANKS FIRED SEPARATELY

The tube still is divided into two sections and fired as two separate stills. Three banks of tubes are placed above the furnaces. The two heating sections which are cradled lengthwise in the still consist of 50 four-inch tubes in each bank. The preheating bank of tubes consists of 42 four-inch tubes placed at the top of the still and running crossways, just below the roof. Instead of erecting one large stack to carry away the flue gases, there are eight small stacks placed at intervals about the roof. The roof is designed to secure an even distribution of the flue gases just under the roof so that

crude passing through the preheater tubes in the top of the still is evenly heated.

Crude flow to the unit follows the usual procedure in that it first passes through heat exchangers en route to the still. The exchangers at this plant consist of 300 feet of six-inch pipe inside of which is placed an equal length of four-inch. Crude flows through the outside piping, which is well insulated, and fuel oil passes through the inner tubing.

Passing from the exchanger the crude is conducted to the preheater bank of tubes in the roof of the still. This still is gas fired, employing Perfecto burners, 10 sections in each side of the furnace. A Foxboro automatic temperature controller regulates the fires or rate of firing, the instrument working from the temperature of the oil leaving the tube banks. With the oil leaving the last tube bank at a temperature of 675 F. sufficient heat remains in the flue gases at the top of the still to preheat the oil passing through the preheater coil to 275 F.

Leaving this section the preheated oil passes into the bottom compartment of the first tower. These towers are both separators and fractionators. They are enlarged bases, or bottom sections into which the hot oil is expanded as it enters. The vaporized portion of the oil rises through the 15 bubble trays in the upper section of the tower, where it is washed by refluxing the same material as is yielded from the tower. The gasoline stream condensed from the overhead vapors of the first tower is usually 68 to 70 A. P. I. gravity with around 330 F. end point. Its removal at this point reduces the work of the real heating elements in the tube still, and leaves the crude stripped of a large proportion of its gasoline. The crude charged to the Pampa plant is somewhat unusual in type as compared to most Panhandle production, as it averages 43.5 A. P. I. gravity and has a gasoline content of about 45 per cent., which is relatively easy to treat to all standard specifications. This crude comes from the Bowers field, south and east of Pampa.

CHARGING CONTROLLED

Crude is pumped from the bottom section of the first tower into the first heating coil of the tube still. All charging pumps and hot oil pumps transfering the residues from towers to still, etc., are electrically driven Wesco rotary pumps with one auxiliary for each group of pumps. Recycle pumps handling reflux material over the towers are motor-driven plunger type with the usual auxiliary or stand-by equipment. The charging or hot oil pumps are regulated in rate of pumping by liquid level controllers which maintain the desired level of oil in the lower compartment of each tower. The second pumping takes suction, on the lower section of number one tower, discharges the oil into the first heating bank of the tube still where it is heated to 540 F. and conducted to the lower section of the second tower-separator.

In the second fractionator and separator live steam is employed to keep the oil in agitation. Vapors rising upward pass through the 15 bubble trays, are washed with naphtha, and condensed in the Sterling sections and taken to storage as 58-60 gravity, 400 end point gasoline. Temperatures at the top of all fractionating columns are maintained constant by control of the volume of reflux material being pumped over them, using Foxboro automatic temperature recorder controllers on each tower.

Residue collecting in the bottom section of the second fractionator is removed under careful control by a third pump which discharges the partially distilled oil into the second heating section of the tubular retort. In this pass through the still the temperature is raised to 675 F. which is sufficient heat to vaporize all of the remaining gasoline, kerosene, and gas oil. Leaving the still the oil and vapors pass into the third fractionating column and the residue collecting in the lower section is pumped through the exchangers, coolers, and to storage.

As the vapors pass upward through the column, the gas oil is removed as a side stream, coming off at the bottom tray to be cooled and taken to storage. The remaining gasoline and kerosene vapors pass overhead and into the fourth bubble tower. Kerosene is collected in the reboiler section at the bottom and removed, and gasoline vapors pass overhead to condenser and storage. These gasoline vapors are collected as a cut of 48-50 A. P. I. gravity naphtha with a 445-450 end point. The bottom stream of kerosene is 41-43 A. P. I. gravity.

FLASHED THREE TIMES

In this type of plant the crude is handled with four pumps, being first charged to preheater coil with the charging pump, and then transferred from reboiler sections twice through the two remaining tube banks and fractionating columns, being heated progressively to higher temperature in the pipe still. In this system crude is heated and flashed three times, as against one, two, and four heatings in other systems. This, of course, depends to a large extent upon the desires of the designer and the type of petroleum being distilled. This installation, it will be recalled, is distilling 43 gravity crude with a 45 per cent. gasoline content and splitting the gasoline fraction into three separate grades. Due to the flexibility of the unit, the Pampa plant produces any of the standard grades of gasoline from 68-70 to 58-60 gravity in the 375-400 end point range, as well as fuel of practically any gravity specification with the customary 437 end point. Slight changes in steam injection, temperature regulations, and recycle materials will effect the desired changes in specifications of finished products and not seriously influence the preparation of a required grade of kerosene, etc.

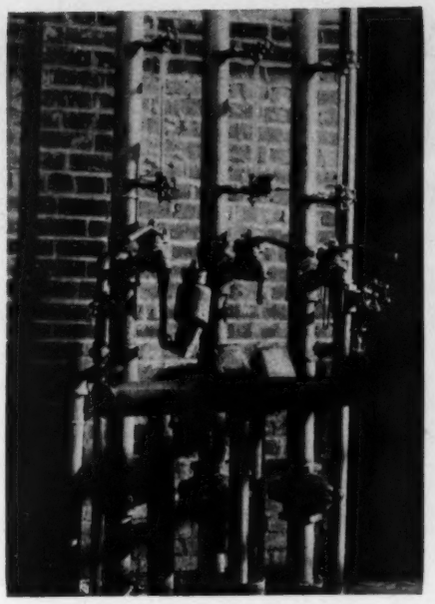
The auxiliary equipment, such as transfer pumps, air compressors, air pump for the gasoline recovery system, are all electric motor driven. Centrifugal pumps are used for water circulation for cooling boxes, and this system is manifolded to tie into the fire hydrants almost instantly. Water for cooling and boiler consumption is lifted electrically from a well on the plant yard 390 feet deep. All loading is done with electric motor driven pumps, and electricity for power purposes is even employed in the treating department and chemicals are handled with small motor-driven plunger type pumps.

GASOLINE RECOVERY SYSTEM

The gasoline recovery system consists of one absorber, the necessary circulating pumps, gathering lines and a No. 4 Connersville blower. This blower takes suction on gathering lines to the various tanks with the vacuum controlled by a Davis vacuum regulator, which holds the tanks at virtually atmospheric pressure. Operation

of this unit differs from that of most refinery installations in that no special absorption medium is provided. The operation of the plant consists of pumping just any gasoline in stock through the absorber and raising it to the desired gravity or initial boiling point specifications. This practice eliminates the necessity of distillation of the absorbed vapors and saves the gasoline which would otherwise be lost in the waste vapors, just as effectively. Residue gases from the absorber are taken to the pipe still and consumed as fuel.

During the summer this small reclaiming unit has recovered 1500 to 2000 gallons of gasoline per day. Gases are not taken to the unit from the receiving house for the reason that the Rowsey system does not include that installation. Instead of the conventional "tailhouse" the run down lines drop to the ground level at the side of the supporting brickwork upon which the condensers rest. The receiving house in this instance consists merely of a Merco Nordstrum inspection valve, and a gauge glass placed on each line. The details of the "outdoors tail house" are shown in an accompanying illustration. The lines are held gas-tight and any unvaporized gases flowing with the oil stream are conducted to the gas-tight run down tanks to find their way into the gasoline recovery system through the gathering lines from tanks to blower. Such practice also minimizes the costs of gathering line installation. The elimination of distilling at the recovery plant also reduces the initial cost of the installation as well as the cost of operation.



Receiving house consists of gauge glasses and inspection valves on run down lines

Roughly estimated, Bowers pool crude is yielding at this plant around 45 per cent. gasoline, five per cent kerosene, 18 to 20 per cent. gas oil and 28 to 30 per cent. fuel oil.

Expansion of Steam Smother Lines

IT is essential that steam lines leading to run down tanks on the refinery yard, and to stock tanks, be equipped in some manner for taking care of the expansion and contraction of the metal piping. Practically all refineries install smother lines, either overhead or under ground, which are used for the purpose of conducting steam to such tanks in time of fire or as a means of precenting flashes in nearby tankage when an adjacent tank is burning.

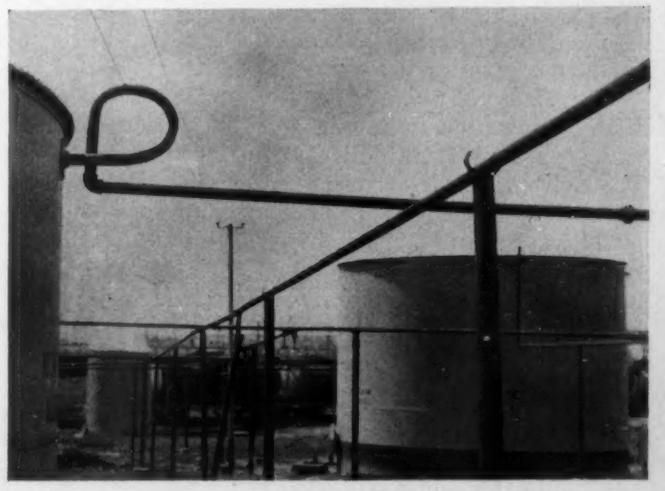
Often the important factor of expansion and contraction of such lines is overlooked. Rigidly connected lines have been known to pull apart or to develop leaks during inspection or testing procedure, because of the contracting of the metal. Then in time of need when steam was turned into the leaking line, most of the beneficial steam was wasted into the atmosphere.

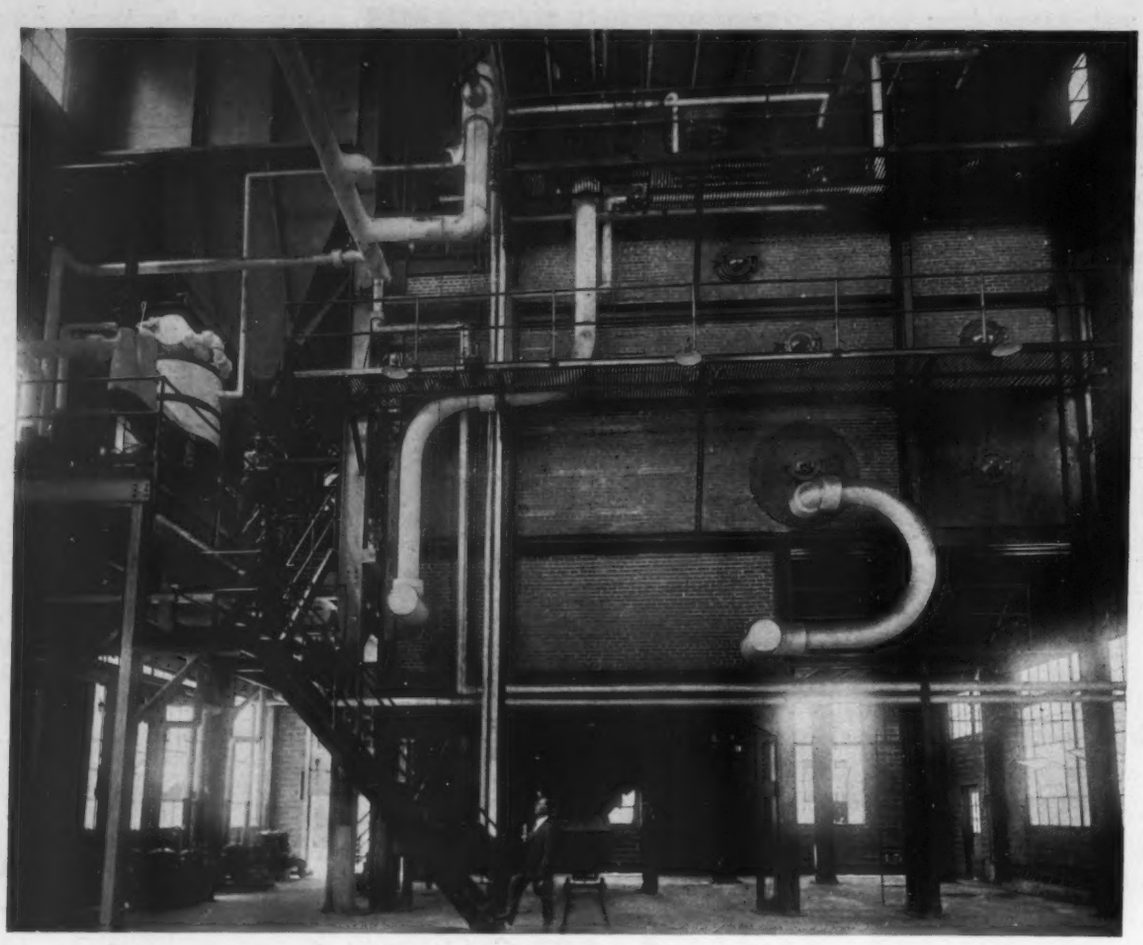
The accompanying photograph illustrates the type of "expansion joint" used by Empire Refineries, Inc., for all steam smother lines. It consists of a simple loop of the two-inch piping, made by the shop crew at times when other work was not pressing. This loop has the advantage of economy, and is positive in its action.

All of the steam smother lines at the Empire plants are periodically inspected and tested to assure their good working order in the event they are needed for quick service. Control valves for the flow of steam into any given tank or tanks, are located at the receiving house in easy reach of the operating stillman.

Often steam manifolds are provided at the main manifold in the receiving house so that when steam is required for either smothering a fire in a certain tank, for the protection of nearby storage, such steam is turned into the run down lines leading to the tanks from the house, by the simple handling of the proper valves.

Both methods are safety and fire preventative methods of importance at the refinery. Such systems, however, should not be neglected, but should be frequently tested and inspected after installation.





Interior of the power plant. Supt. Alexander Lachman is shown at the foot of the steps

Stack Heat Utilized in Steam Generation

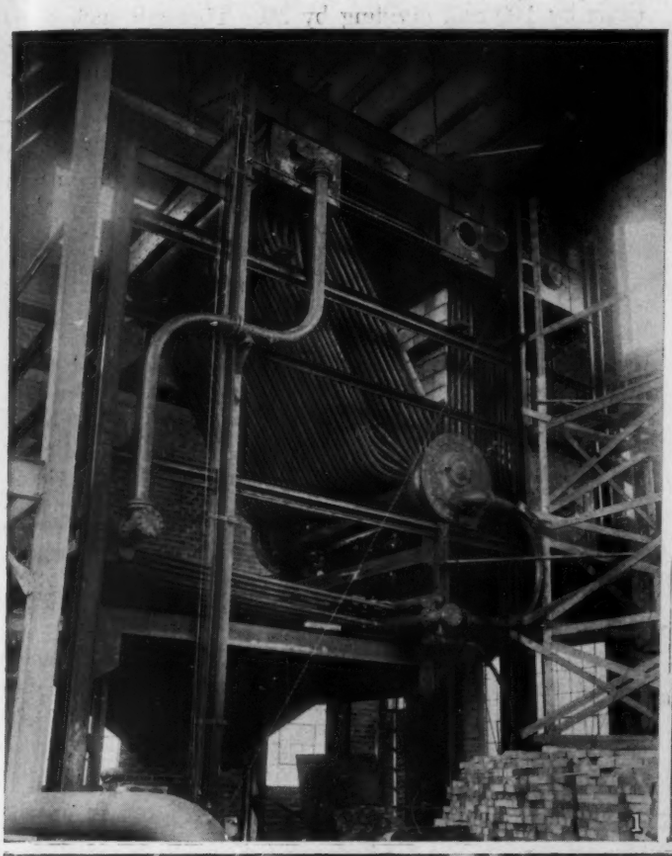
By GEORGE REID
Associate Editor

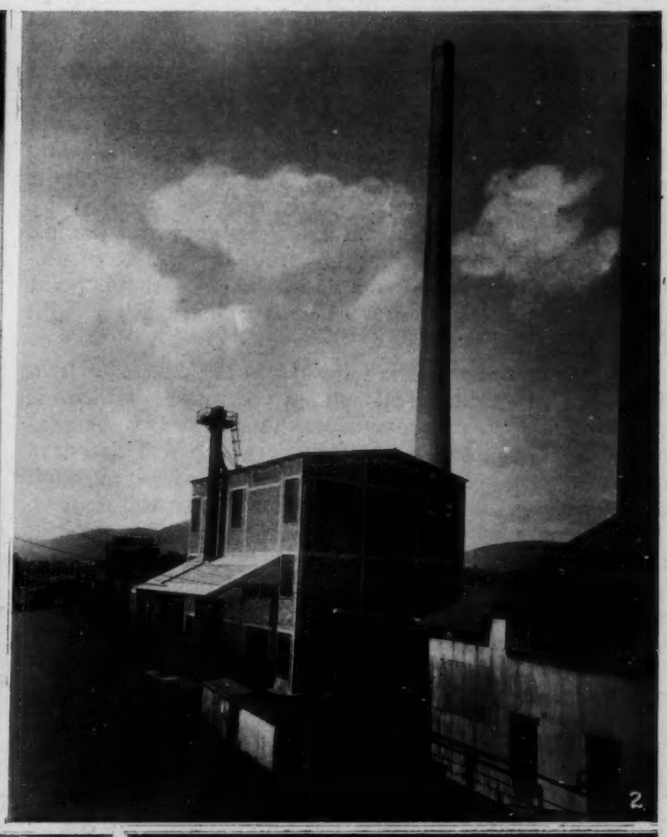
DURING the past year Emery Manufacturing Company, at Bradford, Pennsylvania, has completed the installation of its new power plant and placed it in service. The new 807 horsepower boiler is one of the first in this country, designed to operate mechanically on pulverized coal.

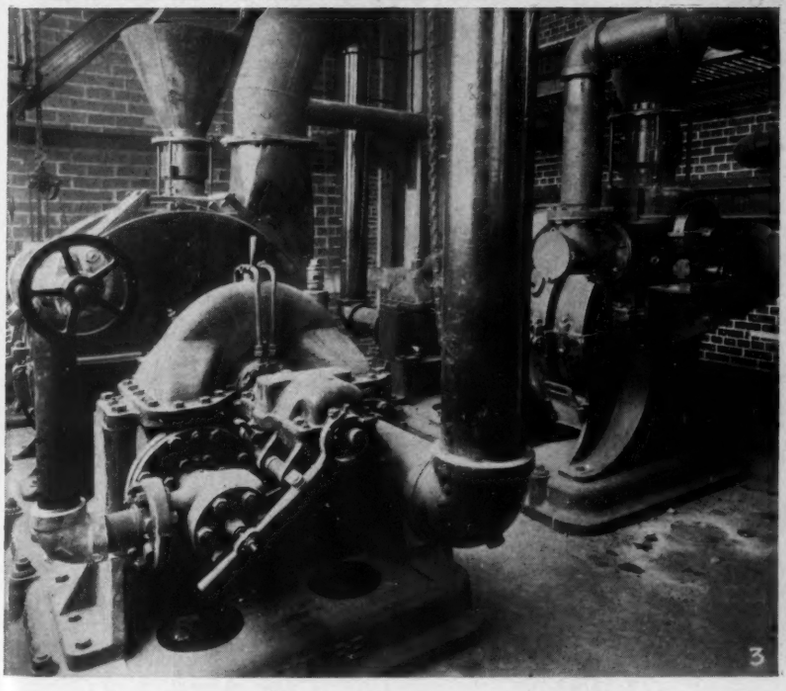
The Emery Manufacturing Company was also the first organization to install and operate a combination circulating type shell still-pipe still unit for processing Pennsylvania crude petroleum. This unit, designed and installed by Alexander Lackman, superintendent of the plant, was built in 1924, and later a second unit of similar type was installed. It was in connection with these units that Mr. Lackman designed and installed his tubular boiler which utilized the waste heat in stack flues for the generating of steam at a saving of around 10 tons of coal daily. This equipment was discussed in THE REFINER AND NATURAL GASOLINE MANUFACTURER, issue of October, 1927. The waste heat boilers were installed very cheaply and for the purpose of supplying sufficient steam to tide the plant over the past winter, while the new power plant was being erected.

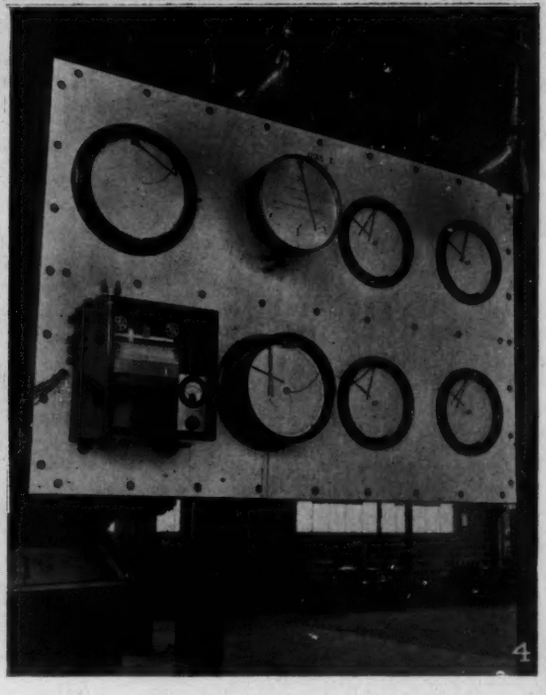
The Emery Manufacturing Company's new power plant is housed in a large, well lighted, excellently ventilated building of brick, concrete and steel, about three stories in height, and fireproof. It is sufficiently large to allow for the installation of a second boiler of the same size and type as is now in operation, whenever plant expansion necessitates such additions. The Emery plant is a complete refinery, making practically every product available from Pennsylvania crude from the Northwestern Pennsylvania fields. The various departments, such as distillation, redistillation, wax plant, refrigeration plants, and compounding plants, require great amounts of heat in constant, unvarying flow, for their successful and uniform operation. This is true of all complete refineries, and in addition, during winter months the entire plant facilities are usually kept heated by steam for the comfort of the employes. To meet these demands for high or low pressure steam, and to assure that peak load requirements might be met in all

Emory Manufacturing Company Power Plant









1—Process picture, showing something of the details of design. 2—Exterior, showing method of unloading and handling coal. The stack in the background is 236 feet high. 3—Two coal pulverizers which crush the slack coal to powder and feed it to the furnace under automatic control. Air is mixed with the coal here. The equipment is steam turbine driven. 4—Centrally located instrument and control board which shows conditions of the power plant at all times

departments without interrupting the same service in any one part of the plant, the company decided to install the present modern automatically regulated power plant.

WATER CIRCUIT

The plant consists of an Erie City three-drum water tube boiler with an 807 horsepower rating. It is equipped with an Erie City water-cooled ash screen and an integral economizer. The details of design of the large boiler are shown in the accompanying progress picture taken before the furnace, etc., was walled.

Boiler water is first handled by a Worthington pump, size 9 x 5½ x 10, of which there are two, one being auxiliary. This pump discharges water to the Elliott deaerator and preheater. Preheating is secured by utilization of exhaust steam from turbines and pumps. The deaerator removes the air from the water, effecting a reduction of corrosion of the boiler. At this point also, the water is heated to 214-215 F., carrying a slight pressure on the preheater.

The preheated water is taken from the deaerator by a Worthington centrifugal pump, two-inch, which is driven by a Kerr steam turbine. There are two installations of this equipment, one being stand-by. This pump delivers the water to the boiler, first passing it through a filter when sand or other foreign matter is removed. The filter is two-sided and manifolded in such a manner that one side may be taken out of service for cleaning, while the other side is in operation, thus eliminating shut-downs for filter cleaning, and at the same time keeping the water continuously filtered.

A Copes feed water regulator controls steam to the centrifugal pumps and thus controls the rate of feeding to the boiler. Rising water, for example, causes a slowing of speed of the pump, and falling water level causes the regulator to speed up the pump. In addition to this automatic regulation the boiler is equipped with the usual gauge glass showing water level, and also a circular pendulum type water level indicator is located on the central instrument or control board.

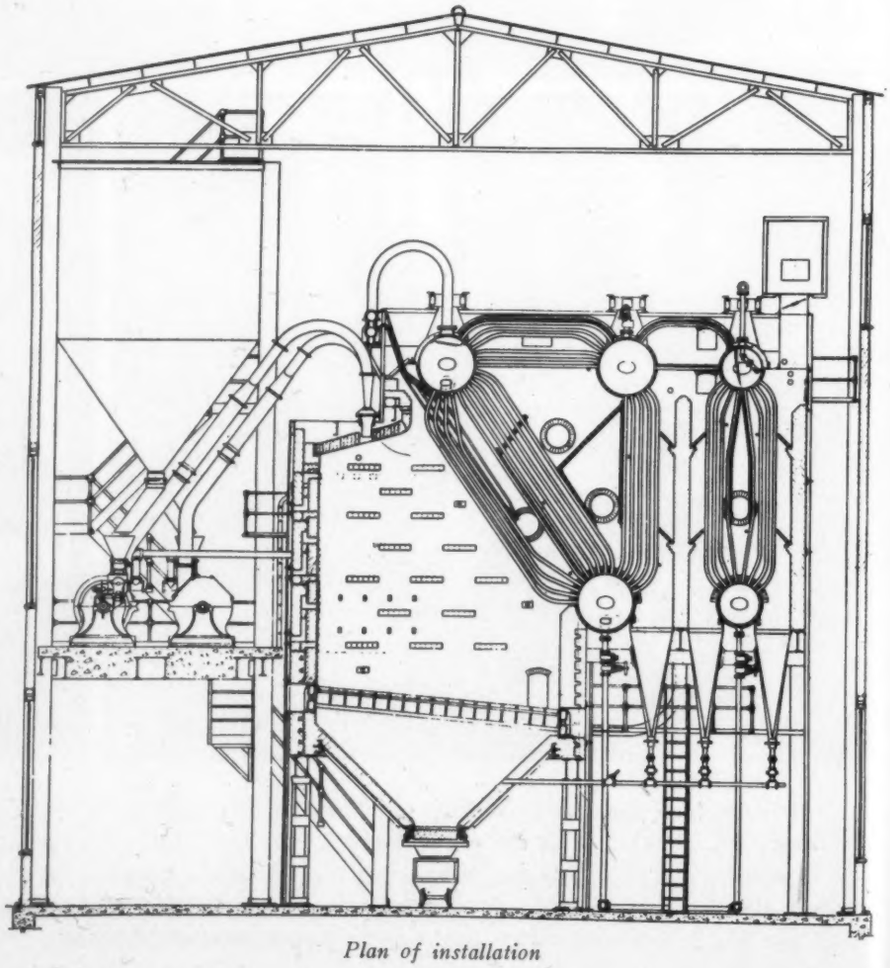
Adequate control instruments are provided for the operation of the power plant. Water temperature is recorded as it enters the economizer section, which is 250 degrees. Leaving the economizer the temperature of 350 degrees is recorded. These temperatures were in force at the time of the writer's visit. A hundred degrees of heat is secured in the economizer. Four American recorders are also found on the instrument or control board. Temperature of the superheated steam ranging 600 degrees is charted, as is the temperature of 350 degrees on the saturated steam—showing a difference of 250 degrees in the two. Steam pressure is recorded in chart form, as is the temperature of the flue gases at the last pass in the boiler—290 degrees. Foxboro stack and furnace draft recorders are installed. Brown Electric Co.[2] recording instrument makes a record of the CO^2 content at all times. There is also a steam flow meter of the same make, both indicating and recording. This instrument indicates by means of numerals at the bottom of the instrument face which are multiplied by the factor 7520 to give pounds of steam per twenty-fours.

The horsepower being generated is secured by simply multiplying the factor indicated or recorded on the chart by 100 and dividing by 30. Through such complete control records and indications, the man in charge of the power house knows at all times much of the efficiency of his plant. The instrument board is lighted by direct lamps and kept spotlessly white. It is said that 12 pounds of steam is generated for every pound of coal burned and that average coal consumption was 20 to 24 tons, or approximately half a car load, per day.

FUEL CIRCUIT

Slack coal is purchased for crushing or pulverizing when it is available. The coal is dumped from the cars to a hopper beneath the tracks and on to a belt type conveyor, to be dumped into a crusher. Any iron or other metallic substances are removed magnetically as the coal goes into the crusher. The crusher is used only when slack coal is unavailable, for this coal comes in very small chunks. From the crusher the coal dumps into a bin, from where it is handled by a bucket elevator and hoisted to the top of the coal bin located near the top of the boiler house. This bin has a capacity of about two and one-half car loads of slack coal.

From the top hopper or bin the coal flows downward to the pulverizers, spilling into a large funnel at the intake end. From this funnel-like hopper the flow of coal is under automatic regulation and only the amount required for firing the boilers is permitted to pass into



Plan of installation

the pulverizer hopper. As the coal spills finally into the crusher sections, warm air in automatically regulated proportions is fed with it. This air comes from the furnace through a pipe duct.

The pulverizers are Erie City unit type, and the crushing series of hammers, of which there are three, are revolved by a Westinghouse 40 horsepower steam turbine, working at the rate of 1200 revolutions per minute. The unit contains a blower section on the other end of the pulverizing portion which picks up the finely powdered coal and blows it into the top of the furnace—feeding downward. This powdered coal is very fine, and 95 per cent. of it will pass through a 200-mesh screen. It burns like gas. When starting the boiler it is usually fired with gas until the heat is sufficient to make the coal dust start burning. The ash is a light gray powder, very fine, and it must be wet with water to keep it from blowing away. About one-half of one per cent is accumulated as ash. The boiler walls are air-cooled with sufficient regulating ducts provided to maintain the desired wall temperature.

Nine Diamond soot blowers are provided, which are used twice daily to remove any accumulated soot on the tubes in various places throughout the boiler. Stack draft is regulated by means of counter balanced cable type damper with controls located near the pulverizers. There are three soot or dust collectors at the rear base of the boiler proper which catch the soot and dust blown off the tubes and this accumulation is jetted by a steam blast into the ash hopper.

Below the water-cooled ash screen, an Allen, Sherman, Hoff Company ash hopper is provided into which the dust-like ash falls from the furnace above. The ash is periodically dumped into a small steel car mounted on rails leading outside of the boiler house.

This single boiler replaced three 250 horsepower boilers formerly used at the plant. The new power house required a new stack, and the smoke stack is 236 feet in height, with a diameter at the bottom of 18 feet, inside, and at the top, seven feet. It is expected that the winter requirements of the plant will see the operation of the new power house at from 125 to 200 per cent. of its rating.

Design and Operation of High Pressure Fractionating Columns*

By E. R. COX
The Texas Company

THE purpose of high pressure fractionating columns is to rectify or stabilize the plant output and hence they are usually termed rectifiers or stabilizers. As it is generally agreed that the undesirable constituents of natural gasoline are the propane and lighter fractions and the desirable constituents, the normal butane and heavier fractions, the object of fractionation is to make as sharp a cut as possible between propane and normal butane. This leaves iso-butane in doubt. Some consider it desirable and others undesirable.

Perhaps the commonest practice is to make a rather rough cut through iso-butane, retaining a portion and rejecting the rest. In this way, a propane-free product can be made without sacrificing any of the normal butane.

Considering this to be the object of our column, we can visualize the operation as follows. At the top of the column, butane is endeavoring to escape in the vapor and we prevent this by pouring in a large amount of propane to wash it back. At the bottom, propane is endeavoring to escape in the liquid and we prevent this by sending up a large amount of butane vapor to carry back the last trace of propane.

The butane vapor traveling upward is progressively replaced by propane. Likewise, the propane reflux travelling downward is replaced by butane. The reason for this replacement is the different vapor pressures of the two. If we boil a mixture of propane and butane, and analyze the vapor given off, we find that the proportion of propane in the vapor is much higher than in the liquid. Conversely, if we condense a small portion of a mixture of propane and butane, the condensate will be much richer in butane than the original vapor. This fractional condensation and revaporization taking place on each tray causes the gradual replacement of butane by propane in the vapor and of propane by butane in the liquid.

Since, as we proceed from the top downward, we are boiling a mixture which is constantly acquiring a higher boiling point, we must increase the temperature from tray to tray.

The foregoing indicates the main requirements of a successful fractionating column. They are:

1. A smooth temperature gradient from top to bottom.
2. An adequate number of trays.
3. Means for condensing the proper quantity of reflux for the column top.
4. Means for providing sufficient ascending vapor at the bottom.

The temperature gradient is naturally attained by the requirements at top and bottom. It is rendered smoother and the operation more satisfying by lagging the column.

MORE TRAYS, LESS REFLUX

Thirty trays have proven quite satisfactory for average plant operation. Theoretically, the greater the number of trays, the less reflux is required. Fifty tray columns are now being seriously considered and seem to promise a substantial reduction in reflux ratio. This would affect both the cooling and heating required, and would indicate a considerable saving in operating costs.

Two means are commonly employed for providing

*Read at meeting of California Natural Gasoline Association, held January 10, 1929, Los Angeles, California.

reflux. The first is a condenser integral with the top of the column. Regulation is obtained by varying the quantity of cooling water and may be either automatic or manual. The second consists in piping the evorhead vapor to a coil in a cooling tower, and pumping back the required amount of condensate. The latter, though perhaps more expensive, obviates scaling difficulties and is very dependable and satisfactory in operation.

Two methods are also in common use for heating the bottom. One is by a built-in heater or coil, and the other by a separate reboiler or kettle. The latter affords more heating surface and a longer time element. Regulation is obtained either by a thermostat controlling the admission of steam or by a pressure reducing valve, manually adjusted. Both types of reboiler and both methods of control have given satisfaction.

When the rectification of gasoline first became general, there was considerable difference of opinion in regard to the proper pressure at which to operate a column. It is evident from the above discussion that pressure itself plays no part in the process. It is important, nevertheless, in that it determines the operating temperatures. A high pressure requires high temperatures at top and bottom, while a low pressure calls for low temperatures. Hence, the problem becomes merely:

"What temperatures can we obtain most easily and economically?"

Operating at from 10 pounds to 15 pounds pressure, the bottom heating may be obtained from exhaust steam, but the top cooling requires refrigeration. This is usally obtained by recompressing the overhead vapor, condensing and expanding the condensate directly into the top of the column.

Operating at from 150 pounds to 175 pounds requires live steam for heating and allows atmospheric cooling for the top. Probably the deciding factor, which has turned the balance against low pressures, is the fact that all gasoline contains a certain amount of water which will freeze in the top trays and cause a great deal of trouble unless the gasoline is first thoroghly dehydrated. To determine the most economical method, the cost of dehydration and recompression must be balanced against the cost of live steam.

CONTROL OF FEED

The control and disposition of the feed is also a matter of importance. The feed is from two or more sources. First, there is the run-down from the main gasoline condenser. This is usually operated at pressures ranging from 15 pounds to 25 pounds. At temperatures obtainable with atmospheric cooling, this leaves a large quantity of uncondensed vapor containing a considerable amount of butane and even pentane and heavier. This may be partially recovered in either of two ways.

First, it may be vented to the suction of the wet gas compressors and so recycled in the absorber.

Or secondly, it may be recompressed in one or two stages. In one stage the pressure is usually carried up to 150 pounds or 200 pounds, in two stages, frequently to 250 pounds or 300 pounds. This would supply three sources of feed to the rectifier: the primary run-down, the low stage condensate, and the high stage condensate. In many of the earlier installations, these were introduced at different levels. This gave considerable trouble through surging. Since all three of these feeds fluctuated and the surges did not synchronize, the result was a spasmodic working of the column. This was overcome by combining all the streams in one surge tank, and feeding the resultant mixture in at one level. If the surge tank is made rather large, say to hold about a three hours run, the feed can be made quite uniform in both quantity and quality. This should be heated in an exchanger, by the outgoing gasoline and further in a steam preheater controlled by a theormostat. The temperature should be about midway between that of top and bottom.

The following hook-up has proven quite satisfactory. The feed from the primary run-down is pumped to the surge tank, the steam operating the pump being controlled by a float valve holding a level in the run-down tank. The uncondensed vapors from the run-down tank are compressed to 175 pounds and pass to a coil in a cooling tower, and thence to an accumulator. The uncondensed vapors here are vented to fuel or the dry line. The condensate is released through a float controlled valve to the surge tank. The pressure here is the resultant between the run-down, approximately 25 pounds, and the recompressor condensate, 175 pounds, and ranges between 90 pounds and 100 pounds. The feed is pumped from this surge tank through an exchanger and preheated into the column by a rate controlled pump, the rate being adjusted from time to time as the level rises or falls. The bottoms run directly into a kettle maintained at a temperature of 250 degrees by a thermostat-controlled steam valve. The kettle is vented back to the column just under the bottom tray. The finished gasoline is released by a float-controlled valve, through the exchanger, through a final coil in the cooling tower and thence to storage. The vapor from the top of the column, at about 110 degrees F. is substantially all condensed in a coil in the cooling tower and collects in another accumalator. The reflux is pumped from this accumulator to the top of the column by a rate controlled pump. A high level is maintained in this accumulator by a float controlled valve releasing the surplus liquid to fuel of the dry-line. This rate controlled pump is really the master-control for the operation of the stabilizing process.

It is by controlling this reflux rate that specifications are met, hence the rate controller should be the best obtainable.

CAPACITY OF COLUMNS

As to the capacity of columns, there are several factors which enter. The upper limit is indicated when a column primes. The priming point is reached when the pressure drop of the vapor through a tray is just equal to the head of liquid in the down pipe, less the friction drop in the down pipe. If the down pipes are too small, the capacity of the column may be increased somewhat by enlarging them. The vapor pressure drop is due to two causes, first, the friction

drop through the perforations or bubble caps, and second, the head of liquid upon a tray. The most effective head of liquid seems to be from four to six inches. If this is fixed and the down pipes are made as large as practicable and the maximum number of perforations or bubbler caps are provided, the only other way to increase the capacity of a column is to space the trays further apart. The first columns were frequently built with a 12-inch tray spacing. This has been gradually increased to 15, 18 and even 21 inches. It is possible the economical limit has not yet been reached.

As to the respective merits of perforated plates and bubbler caps, there is a wide difference of opinion. If a column is operated at or near its normal load, perforated plate trays are entirely satisfactory. For small loads, however, it is claimed that bubbler caps are preferable, since they do not allow the liquid to drop through.

The following examples roughly indicate capacities which may be expected:

Column A—42-in diameter—bubble caps—12-inch spacing 2¾-inch head of liquid—150 pounds W. P.—Primed at 30,000 gallons per day.

Column B—42-inch diameter—perforated plates—16-inch spacing—four-inch head of liquid—150 pounds W. P.—carried 50,000 gallons per day without priming.

Column C—26-inch diameter—perforated plates—14-inch spacing—five- to six-inch head—190 pounds W. P.—carried 9000 to 26,000 without priming.

Column D—18-inch diameter—performated plates—12-inch spacing—two-inch head—170 pounds W. P.—primed at 17,000 gallons.

Survey of Natural Gasoline Plants In California

DURING the last quarter of 1928 California natural gasoline production averaged one and three-quarter million gallons per day. This production came from a total of 145 operating plants. Development of deeper producing zones in the Long Beach and Santa Fe Springs fields resulted in increased natural gasoline production in the southern manufacturing district. Northern California gasoline manufacture was slightly influenced by the discovery of the light oil fields of Elwood and Kettleman Hills.

As shown in Table 1, production of natural gasoline in California has increased from a daily average of 1,416,900 gallons in December, 1927, to 1,790,901 gallons in December, 1928. The marked increase in gasoline production with the development of the deeper zone at Long Beach had much to do with the general increase in statewide production. The Long Beach field was producing a daily average of 290,501 gallons in January, 1928, which has increased rapidly during the past few months to approximately 700,000 gallons daily in November of 1928. December production was 684,036 gallons daily. The next fields of importance are Santa Fe Springs and Ventura Avenue, which reported a production of around six million gallons each during December, 1928. Gasoline production at Long Beach has been above 20 million gallons per month for the past five months.

In number of operating plants the Long Beach field leads with a total of 29 reported January 1, with one idle installation and one building. The latter is Richfield Oil Company's Meader plant, which has since been placed in operation. There is a total of 162 natural gasoline manufacturing installations reporting in the entire state of which number 145 are operating. Thirteen plants report idle, and four were building, January 1. Since this time Rio Grande-Barnsdall have completed the gasoline plant in the newly discovered Elwood field, which has a rated capacity of 35 million feet, but is reported treating 20 million cubic feet daily.

In the Kettleman Hills field which was recently discovered by the Milham Exploration Company, The Texas Company has an absorption type natural gasoline plant under construction, which will treat the gas from

TABLE 1
SUMMARY OF NATURAL GASOLINE MANUFACTURE IN CALIFORNIA

	December, 1928		January, 1929 Gasoline Production	
Fields—	Gas Treated M. cubic ft.	Daily Gas average	Gallons Month	Daily average
Dominguez	732,088	23,615	1,480,532	47,759
Fullerton & Whittier	1,292,517	41,694	2,648,237	85,427
Huntington Beach	1,786,354	57,624	3,994,820	128,865
Inglewood	603,963	19,483	631,648	20,376
Long Beach	11,570,000	373,225	21,205,122	684,036
Montebello	236,394	7,626	106,226	3,427
Newhall	6,180	199	15,691	506
Protero	94,310	3,042	70,267	2,267
Richfield	1,284,082	41,422	1,850,275	59,686
Rosecrans & Athens	578,937	18,675	1,100,873	35,512
Salt Lake	13,972	451	37,835	1,221
Santa Fe Springs	4,739,592	152,890	6,664,672	214,989
Seal Beach	1,729,452	55,789	2,702,335	87,172
Torrance	338,392	10,916	547,808	17,671
Belridge	68,000	2,194	134,391	4,335
Coalinga	6,666	215	4,872	157
Elk Hills	386,662	12,473	557,182	17,974
Lost Hills	41,294	1,332	35,869	1,157
Midway	1,742,665	56,215	3,848,647	124,150
Santa Maria	221,430	7,144	562,875	18,157
Snuset	351,597	11,342	428,696	13,829
Ventura Avenue	6,219,888	200,642	6,017,228	194,104
Ventura County	583,151	18,811	861,025	27,775
Wheeler Ridge	19,127	617	10,816	349
Total December 1928	34,646,712	1,117,636	55,517,942	1,790,901
Total November	31,143,190	1,038,106	52,384,305	1,746,143
December increase	3,503,522	79,530	3,133,637	44,758
Total October, 1928	30,444,679	982,086	52,032,622	1,678,472
September, 1928	30,154,441	1,005,148	51,124,884	1,704,163
August, 1928	30,149,339	972,559	52,359,214	1,689,007
July, 1928	30,340,520	978,728	51,141,850	1,649,737
June, 1928	28,402,957	946,763	48,584,158	1,618,473
May, 1928	27,976,765	902,476	48,791,092	1,573,906
April, 1928	25,830,544	861,018	45,493,157	1,516,438
March, 1928	25,465,430	820,494	44,262,521	1,427,812
February, 1928	24,259,503	836,524	40,610,133	1,400,341
January, 1928	25,770,079	831,292	43,409,396	1,400,301
Dec., 1927	25,115,125	810,162	43,923,900	1,416,900

the discovering company's 4000-barrel well. Oil produced at this well is 58-60 gravity and is practically all gasoline and white in color. Rich gas is produced and future development of the field should result in the installation of additional gasoline extraction equipment. Several drilling ventures near the discovery well are now under way.

Standard Oil Company of California has completed construction of its 20,000,000 cubic feet, capacity, gasoline plant at Santa Fe Springs, and placed the plant in operation January 26. Further increase of gasoline production in this field, as a consequence of the development of its deeper zones, is indicated by the doubling of capacity of gasoline plants by General Petroleum Company, The Texas Company, and Norwalk Company. All of the newer installations and all of the enlargement of plants in the state this year have involved the use of absorption type equipment for gasoline extraction.

Table 2 is a complete list of all natural gasoline plants, operating or idle, in California. Locations are given by fields where operations are carried out, with the cubic feet of natural gas treating during the month of December, 1928, and the month's production of natural gasoline. In addition the average A. P. I. gravity of the gasoline so manufactured is reported.

TABLE 2
California Natural Gasoline Manufacturers, January 1, 1929

Field and Company—	Gas treated M. cu. ft. Dec. 1928	Gallons Gasoline Dec. 1928	Av. A.P.I. Grav.
DOMINGUEZ—			
Shell Company	113,200	271,813	77.2
Standard Gasoline Company.	107,384	112,844	75.8
Union Oil Company	511,504	1,047,925	83.0
U. S. Refining Company	Tail Gas	47,950	86.0
Total	732,088	1,480,532	
FULLERTON AND WHITTIER—			
Brea Canyon Oil Company	150,000	320,433	80.6
Fullerton Oil Company	70,000	135	78.5
General Petroleum Corp.	Idle	Idle	Idle
Olinda Gasoline Company	32,166	106,166	72.0
Shell Co. of California	555,686	1,052,623	74.0
Standard Gasoline Co. (Brea)	46,550	125,696	78.3
Standard Gasoline Company (M. C.)	255,869	524,776	83.8
Standard Gasoline Company (Whittier)	10,110	12,565	71.3
St. Helens Petroleum Co.	5,000	6,387	78.0
Union Oil Company	167,136	364,365	72.0
West Coast Refining Co. (Basten)	Idle	Idle	Idle
Total	1,292,517	2,648,237	
HUNTINGTON BEACH—			
O. C. Field Gaso. Corp. No. 1	128,434	629,331	71.3
O. C. Field Gaso. Corp. No. 3	46,649	93,299	74.5
Holly Oil Co.	Idle	Ilde	Idle
Richfield Oil Co. No. 13.	60,559	245,588	78.4
Standard Gasoline Company Nos. 1 and 2	257,447	578,130	84.1
Standard Gasoline Company Nos. 3 and 8	465,587	962,594	84.5
Standard Gasoline Company Nos. 4 and 7	559,019	960,598	81.4
Sunset Pacific Oil Co.	30,857	88,101	
The Texas Company Nos. 10 and 16	85,336	282,294	75.0
Union Oil Company	152,466	154,885	65.0
Total	1,786,354	3,994,820	
INGLEWOOD—			
Pacific Western Oil Co.	115,775	199,852	70.0
Shell Company	38,170	85,516	81.0
Standard Gasoline Company No. 1	140,880	148,118	76.8
Standard Gasoline Company No. 2	Idle	Idle	Idle
Standard Gasoline Company No. 3	309,138	198,162	75.0
Total	603,963	631,648	
LONG BEACH—			
Bankline Oil Co.	618,684	946,677	85.6
General Petroleum Corp.	114,628	210,880	81.0
Gilmore Oil Company	491,344	781,237	70.0
Gilmore-Dabney Nos. 1, 2, 3	752,164	1,379,985	83-84
Lomita Gasoline Co.	1,408,448	2,358,064	86.0
Richfield Oil Co. No. 6.	Idle	Idle	Idle
Richfield Oil Co.-Pan American	595,390	987,335	
Richfield Oil Co.-Pan American No. 7	158,033	297,340	72.0
Richfield Oil Co.-Pan American No. 8	285,910	564,169	72.0
Reservoir Hill Gasoline Co.	470,460	629,329	78.0
Ryan & Hackett	7,802	40,664	
Signal Gasoline Corp., Nos. 1, 2 and 8	1,180,881	2,200,314	80.3
Signal Gasoline Corp. Nos. 5 and 6	390,509	687,571	81.6
Shell Company	2,548,342	5,134,164	79.0
Standard Gasoline Co. Nos. 1, 2 and 4	497,696	1,111,092	85.2
Standard Gasoline Co. No. 3	Tail Gas	102,576	86.6
The Texas Company No. 1.	152,349	412,779	
The Texas Company No. 2.	275,395	442,399	
The Texas Company No. 3.	226,304	381,768	
The Texas Company No. 5.	880,812	1,646,212	
The Texas Company No. 6.	299,472	501,718	
The Texas Company No. 7.	151,180	193,761	
Western Natural Gasoline Co.	64,017	95,088	
Total	11,570,000	21,205,122	
MONTEBELLO—			
Standard Gasoline Co.	206,932	72,541	63.7
St. Helens Petroleum Co.	7,000	8,302	75.5
The Texas Company No. 11.	22,462	25,383	
Total	236,394	106,226	
NEWHALL—			
Standard Gasoline Co.	6,180	15,691	81.4
Standard Engineering Co.	Idle	Idle	Idle
POTRERO—			
Standard Gasoline Co.	94,310	70,267	80.1
RICHFIELD—			
Industrial Fuel Supply Co.	Idle	Idle	Idle
Standard Gasoline Co.	116,372	273,490	85.2
Union Oil Co.	612,711	635,319	72.0
West Coast Refining Co.	554,999	941,466	75.0
Total	1,284,082	1,850,275	
ROSECRANS AND ATHENS—			
Cowan Gasoline Co.	21,811	69,630	80.0
General Petroleum Corp.	Idle	Idle	Idle
Richfield Oil Co. No. 5	Idle	Idle	Idle
Standard Gasoline Co.	43,251	55,081	75.5
The Texas Company No. 4.	24,804	145,583	78.3
Union Oil Co.	489,071	830,579	78.0
Total	587,937	1,100,873	

Field and Company—	Gas treated M. cu. ft. Dec. 1928	Gallons Gasoline Dec. 1928	Av. A.P.I. Grav.
SALT LAKE—			
Gilmore Oil Company.....	Idle	Idle	Idle
Rancho La Brea	13,972	37,835	69.0
SANTA FE SPRINGS—			
General Petroleum Corp....	301,552	486,061	71.0
Norwalk Company	1,430,769	1,508,737	70.0
Rio Grande Oil Co.	244,428	314,483	83.0
Standard Gasoline Co. No. 3	1,104,416	1,659,945	85.2
The Texas Company No. 9..	808,878	1,318,375	82.0
Union Oil Co.	419,550	607,747	77.0
Wilshire Oil Co.	429,999	769,324	75.0
Total	4,739,592	6,664,672	
SEAL BEACH—			
General Petroleum Corp....	121,810	194,838	
Geo. F. Getty Gasoline Co..	156,000	141,000	
Pacific Western Oil Co.....	86,795	127,320	
Richfield Oil Co. No. 14....	513,277	833,510	
Standard Gasoline Co. Nos. 1 and 2	853,782	770,865	84.0
State Gasoline Corp.	367,788	634,802	
Total	1,729,452	2,702,335	
TORRANCE—			
C. C. M. O. Co.	100,833	210,775	73.7
Export Refining Co.	52,172	96,680	72.9
Richfield Oil Co.	12,111	36,217	75.0
Standard Gasoline Co. No. 2	38,804	38,857	81.3
Standard Gasoline Co. No. 3	60,154	94,323	73.8
Superior Oil Co.	74,318	70,956	78.0
Total	338,392	547,808	
BELRIDGE—			
Belridge Oil Co. No. 6.....	30,000	61,324	72.8
Belridge Oil Co. No. 7.....	30,000	61,067	70.6
Carners Oil Co.	8,000	12,000	73.0
Total	68,000	134,391	
COALINGA—			
Italo Petroleum Corp.	6,666	4,872	76.0
Shell Company	Idle	Idle	Idle
ELK HILLS—			
Belridge Oil Co.	126,224	182,409	70.8
Richfield Oil Co.	87,314	137,716	69.8
Standard Gasoline Co.	72,452	93,685	76.5
Standard Gasoline Co.	100,672	143,372	80.0
Total	386,662	557,182	
LOST HILLS—			
Universal Oil Company	41,294	35,869	71.6
MIDWAY—			
Honolulu Consolidated Oil Co. (3 plants)	611,286	1,457,631	79.0
Lovell Gasoline Co. No. 4..	109,258	289,037	77.5
Lovell Gasoline Co. No. 6..	Idle	Idle	Idle
Mid-Oil Refining Co.	2,945	3,100	73.0
North American Oil Co.....	14,773	51,351	78.8
Richfield Oil Co.	Idle	Idle	Idle
Standard Gasoline Co. 7-D and 9-D	260,776	564,539	80.0
Standard Gasoline Co. 1-C and 2-C	325,111	646,007	80.0
Standard Gasoline Co. 31-B	128,349	122,839	74.7
Standard Gasoline Co. 23-D	Tail Gas	76,440	81.9
Standard Gasoline Co. 16-D	131,964	295,644	80.0
Standard Gasoline Co. 29-G	140,432	308,729	80.0
St. Helens Petroleum Co. ..	17,770	33,330	76.0
Total	1,742,664	3,848,647	
SANTA MARIA—			
American Natural Gasoline Corp.	Idle	Idle	Idle
Rice Ranch Oil Co. Nos. 1 and 2	75,000	162,528	80.0
Shell Company	49,128	112,950	76.0
Union Oil Co.	97,302	287,397	80.0
Total	221,430	562,875	
SUNSET—			
Lovell Gasoline Co. No. 7..	74,047	72,357	68.0
O. C. Field Gasoline Corp...	84,350	85,487	76.0
Richfield Oil Co. No. 11	43,421	80,908	73.0
Richfield Oil Co. No. 15....	12,087	14,613	69.0
Standard Gasoline Co.	137,692	175,331	78.0
Total	351,597	426,696	
VENTURA AVENUE—			
Bolsa Chica Oil Co.	181,188	228,179	88.3
General Petroleum Corp. ...	582,419	651,559	88.0
Pacific Western Oil Co.	839,335	827,250	
Shell Company Nos. 1 & 2..	2,622,335	2,659,863	
Standard Gasoline Co. No. 1	280,698	279,836	94.0
Standard Gasoline Co. No. 2	1,029,309	827,184	91.2
Standard Gasoline Co. No. 4	684,604	543,357	91.7
Total	6,219,888	6,017,228	
VENTURA COUNTY—			
Calumet Oil Co.	10,000	16,873	78.0
Cienega Corp. (Saticoy) (Lovell Gasoline Co.)	Tail Gas	82,788	
Cienega Corp. (Fillmore) (Lovell Gasoline Co.)	Tail Gas	87,074	
Richfield Oil Co. (Rincon)..	250,614	331,387	
The Texas Co. No. 12 (Oak Ridge)	251,888	252,780	77.0
The Texas Co. No. 13 (Shields)	57,238	67,087	
Union Oil Co. (Santa Paula)	6,900	5,883	
Union Oil Co. (Torrey-Piru)	6,511	17,153	72.0
Total	583,151	861,025	
WHEELER RIDGE—			
Standard Gasoline Co. KC 2	19,127	10,816	69.5

TABLE 3

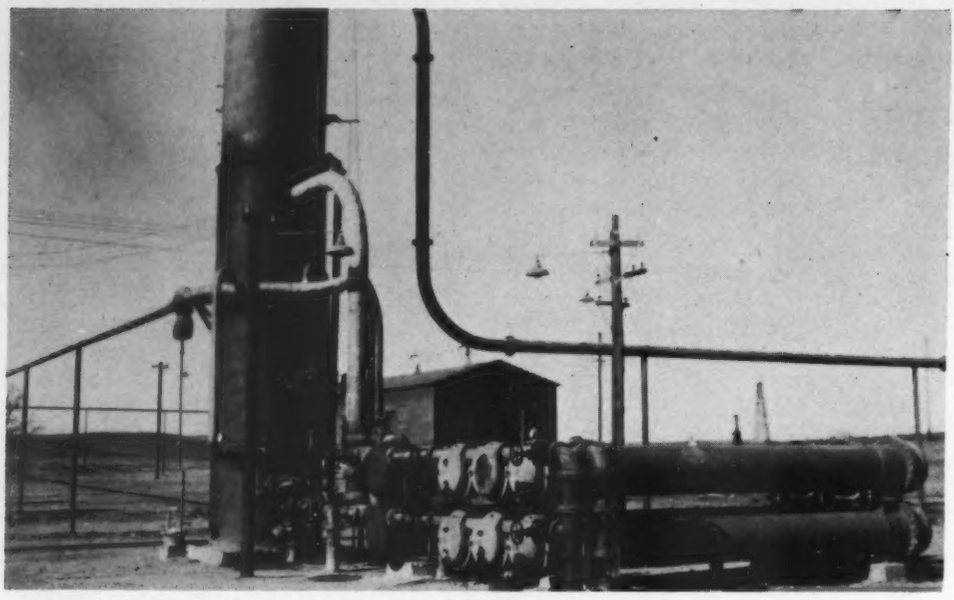
Summary of Operating, Shut Down, and Building, Natural Gasoline Plants in California, by Fields, as of January 1, 1929:

	Operating	Idle	Building
Dominguez	4	..	..
Elwood	..	..	1
Fullerton and Whittier	10	1	..
Huntington Beach	13	1	..
Inglewood	4	1	..
Kettleman Hills	..	..	1
Long Beach	29	1	1
Montebello	3	..	..
Newhall	1	1	..
Potrero	1	..	..
Richfield	3	1	..
Rosecrans and Athens	4	2	..
Salt Lake	1	1	..
Santa Fe Springs*	9	..	1
Seal Beach	7	..	..
Torrance	6	..	.
Belridge	3	..	..
Coalinga	1	1	..
Elk Hills	4	..	..
Lost Hills	1	..	..
Midway	15	2	..
Santa Marie	4	1	..
Sunset	5	..	..
Ventura Avenue	8	..	..
Ventura County	8	..	..
Wheeler Ridge	1	..	..
Total	145	13	4

*Three plants at Santa Fe Springs doubled capacity, January, 1929.

Natural Gasoline Production in Long Beach Area, 1928, Twenty-nine Operating Plants:

Month, 1928	Gallons Month	Gasoline daily Av. Gallons	Average gas treated M. cubic ft.
January	9,005,535	290,501	121,785
February	9,223,526	318,052	138,468
March	10,957,147	353,456	150,330
April	13,043,224	434,774	196,528
May	15,841,554	511,018	244,166
June	16,746,192	558,206	300,451
July	18,594,252	599,815	332,660
August	20,071,160	657,457	355,033
September	20,593,609	686,454	385,371
October	20,407,085	658,293	359,273
November	20,908,459	696,949	381,685
December	21,205,122	684,036	373,225



Distillation unit and battery of six heat exchangers connected three in a series and manifolded so that one series may be blocked out of the circuit for cleaning or repairs.

ColTexo Plants Have Advantage of Rich Panhandle Gas

By GEORGE REID
Associate Editor

GAS from the Lefors, Texas, field is slightly richer in gasoline content than that from other Texas Panhandle pools. Gasoline content in this area is from .35 to .65 gallons per thousand cubic feet. In the Lefors field, gasoline content averages one gallon per thousand cubic feet, and has the additional advantage of requiring no chemical treatment to render it sweet and non-corrosive.

In this field, ColTexo Corporation is processing gas through two completed gasoline plants and in January of this year had the third plant partially erected. Residue gas from these installations is consumed in the carbon black plants of an affiliated company. ColTexo Corporation is a subsidiary of Columbian Gasoline Corporation which operates a number of gasoline plants in the Monroe, Louisiana, gas field.

ColTexo Corporation's Plant No. 1, is located in the east end of the field. Plant layout follows the customary rectangular design, with absorption extraction equipment and distillation unit located centrally for convenience of control and operation. All of the plant buildings are of the unit type, standardized Truscon structural steel and sheet metal.

Gas entering the plant from the east and west sides of the field passes through two double scrubber installations. Usually but one scrubber is employed, holding the other as auxiliary. Gas is boosted to plant operating pressure in the booster plant, located adjacent to the absorber equipment. This plant consists of 16 C. & G. Cooper, 170-horsepower engines and compressors which are set on 14-foot centers. The engine room building is approximately 250 feet in length. Each engine air intake line is equipped with a large air filter.

The compression plant is designed to handle 20,000,000 cubic feet of gas daily, which gives the plant a capacity rating of 20,000 gallons of gasoline.

Gasoline is extracted from the gas in five Jackson Engineering Company low presure absorbers. Dimensions of the absorbers are five feet by 31 feet and six inches. The company does not employ any regulatory devices for apportionment of gas flow into the individual absorbers other than a series of manually controlled block valves. To guide the operator however, and to make possible the careful checking of volume of gas flow into each separate absorption tower, orifice plates are installed in each gas inlet line. Instead of operating a separate Westcott orifice meter for each tower, however, the company uses but one master meter to which separate small lines lead from each orifice plate in the gas inlet lines to absorbers. The five small lines are manifolded at the meter in such a manner that the chart record indicating volume of gas flow to each absorber may be indicative of any one absorber under inspection. Flow of oil from the absorbers is regulated by Fisher Liquid Level controllers. Residue gas is conducted from the absorbers through scrubbers and metered to the carbon black plant.

All of the absorption plant operating pumps are of the centrifugal type and motor driven. All of the pumps are Dayton-Dowd. Two are employed for cooling-water circulation, pumping water over the Fluor cooling tower. Engine cooling water is handled in a separate circuit; water flowing over the engine jackets is cooled in a separate cooling tower, using another pump for this purpose and having one stand-by unit. Three centrifugal pumps are used for fat and lean oil circulation, one

being an auxiliary pump. These pumps are of the multi-stage type. Two additional pumps, one being stand-by, serve to circulate water to reflux coolers, condensers, and oil coolers. The pump house and equipment are kept spotlessly clean and freshly painted.

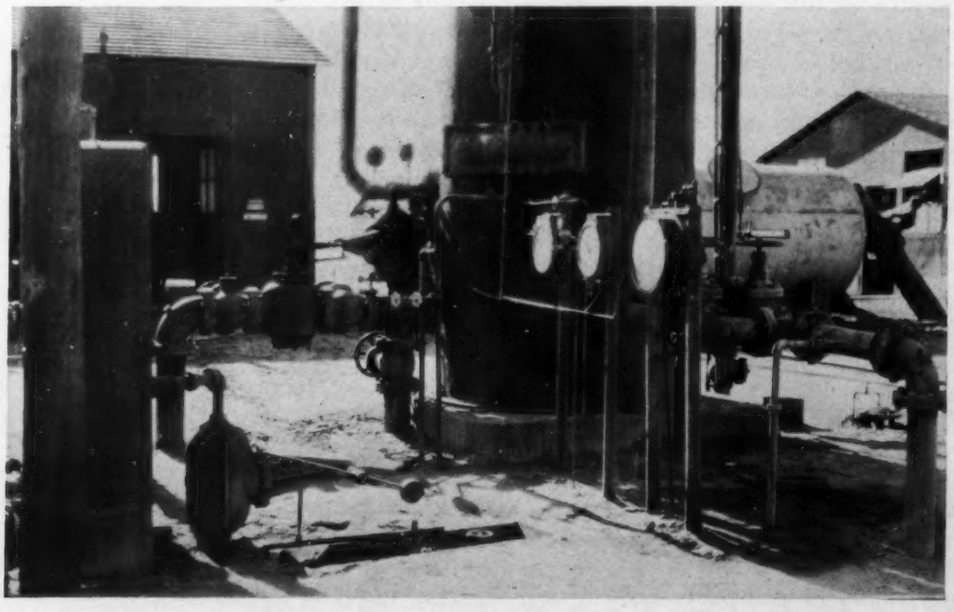
Lean oil flow from the pump house to absorbers and the remainder of the circuit follow customary practice. From the absorbers enriched oil passes through a battery of six Griscom Russel exchangers which are installed in two series of three exchangers each. These exchangers are so manifolded that either the top or bottom series of three may be taken out of service for repair or cleaning without seriously interrupting the operation of the plant. While three exchangers may temporarily impair heat exchange efficiency, such shut downs are of short duration, and occur but seldom. On the other hand, where exchanger equipment is not provided with by-pass lines so that a portion of such equipment may remain in service, it becomes necessary to stop operating the entire plant in the event of necessary repairs or cleanings.

Leaving the exchangers the partially heated oil flows into the two preheaters of the same type which use live steam as the heating medium, and into the Jackson type distillation equipment. Incidentally, the exhaust steam leaving the preheaters is conducted to the power house, condensed and bled into the boiler water feed tank. Dimensions of the still are five feet by 31 feet six inches. A Tagliabue automatic temperature recorder controller regulates the still temperature following the usual method of application. Liquid level controllers maintain a constant level of oil in the still from where it passes to cooling coils and is again ready for the absorption circuit.

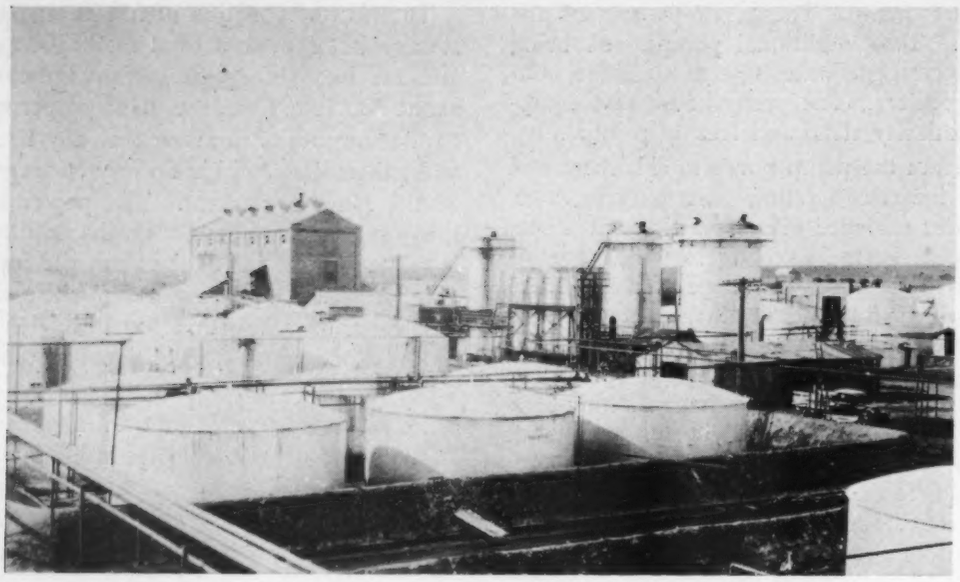
Gasoline vapors leaving the still are conducted through the dephlegmator and to condensers. The distillate accumulates in a small tank which is provided with a Fisher liquid level controller. As the accumulating gasoline overflows from this tank it is blown to storage under plant operating pressure. In this method of handling the look-box is eliminated.

To effect a reduction of fire hazard all eight gasoline storage tanks, with a total of 200,000 gallons capacity, and the two absorption oil storage tanks, are located about 500 feet from the plant proper and "down-hill," so that any leaks in storage or any fires at the storage tanks themselves will in no way endanger the remainder of the plant equipment. The power house, being the greatest source of danger on the natural gasoline plant, is located on the end of the plant site farthest away from plant storage. Gasoline stored at the plant is transferred by steam pump, Worthington 14 by 4¾ by 12 inches, 13 miles to loading rack. Additional gasoline storage is provided at this point.

Power houses at all of the Columbian Gasoline Corportion and ColTexo Corporation gasoline plants are provided with adequate accurate boiler control instruments to the end that power house operation does not require the usual constant attendance. The ColTexo Corporation plant No. 1 at Lefors is no exception to company policy. Four Casey Hedges 100-horsepower horizontal return tubular boilers operate continuously and practically without supervision, except for occasional inspection by the operator on shift. A Fisher type fuel regulator operating by actuation from steam pressure in the steam header line, lowers or increases the volume of gas passing through the burners. Each boiler is provided with a Dequesne Combustion Unit, or burner, with visible draft indicators incorporated in their design. The Worthington feed water pumps are controlled as to water feed into each boiler by Copes feed water regulators. All valves on the boiler blow down lines and drain lines from the water columns are equipped with Merco Nordstrom lubricated stop cocks which makes for ease in opening and closing these valves. A special heat resisting lubricant for these valves when used in such service is provided by the manufacturer. Water for plant operation and boiler consumption is secured from two wells on the plant yard which are produced by jetting with air. Zeolite treatment is necessary to reduce hardness of the water to about four grains.



Close-up of control and regulator equipment which assure smooth operation of the ColTexo Corporations' No. 1 Plant at Lefors



General view showing run-down storage, treating plant assembly to the right, and filter house in background. Aluminum paint is extensively employed

Transcontinental a Pioneer in Tube Still Distillation

By GEORGE REID
Associate Editor

ONE of the earliest tube still and fractionating column type of petroleum refining plants to be installed in the Mid-Continent was placed in operation at the Boynton, Oklahoma, plant of the Transcontinental Oil Company in 1920. At the time these double pipe still units with their seven towers where various condensates were removed by partial condensation, was more or less a departure from common refining practice, for at that time, it will be recalled, many refineries had not yet accepted continuous operation of shell still batteries, and the tube still was in its infancy and not to be extensively employed for several years.

The Transcontinental Oil Company's pipe stills, operating very much today as they were eight years ago when they were pioneers in the field of continuous distillation, compare very favorably in economy of operation with many of the present day more modern units. The stills are made of three-inch tubing, the banks being placed in two compartments, one of which is fired and termed the "hot side" and the other serving as a preheater bank, placed in a separate chamber and utilizing the heat of the gases of combustion after they leave the "hot side." In this chamber the oil flows upward progressing through the cooler tubes at the bottom up to the hotter tubes at the end of the tube bank, then passing into the heated side of the still furnace, where they pass downward progressively into hotter tubes, finally leaving the furnace heated to sufficient temperature to effect the vaporization of all gasoline, kerosene, and gas oil, down to cylinder stock.

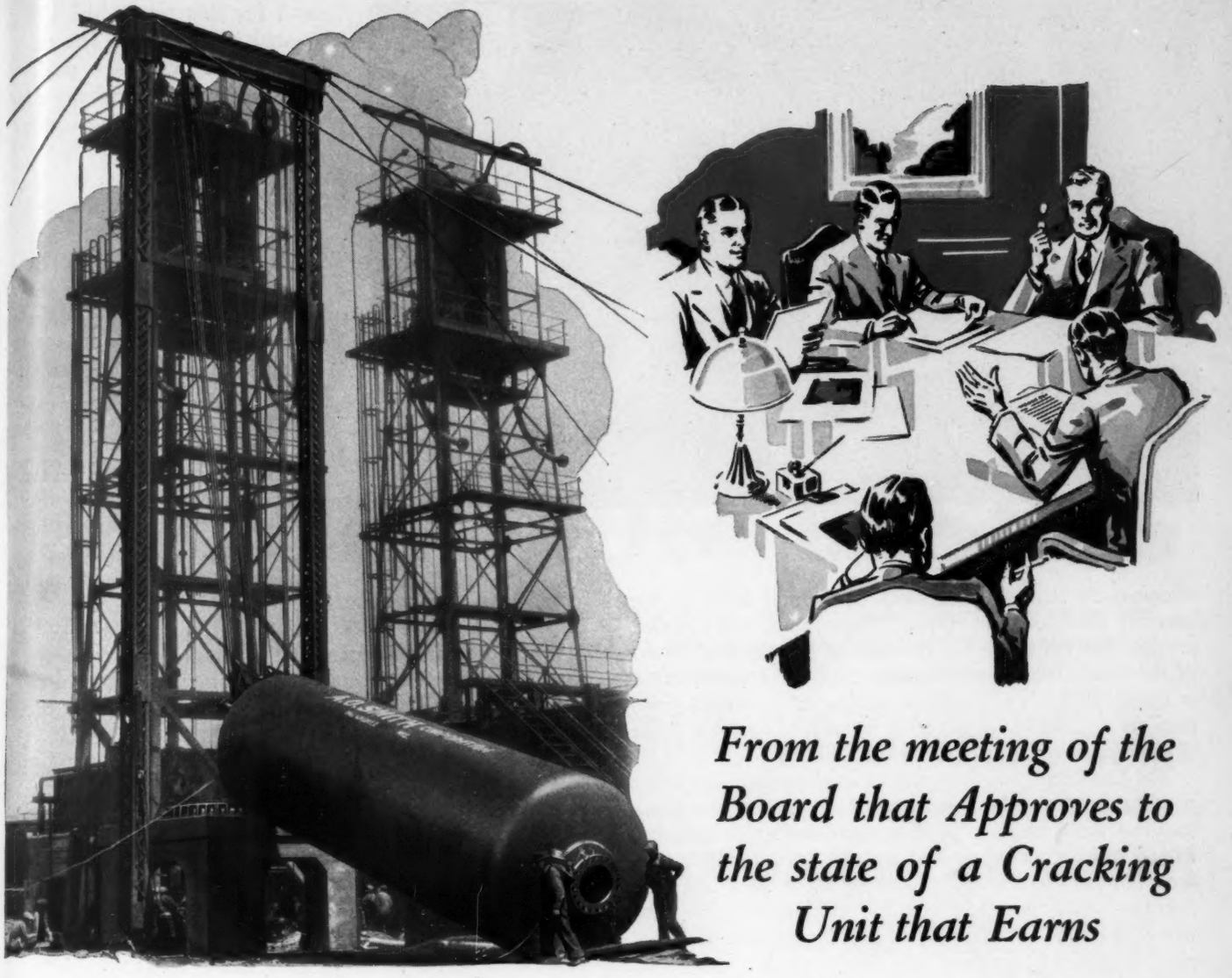
Another feature which the plant was early to adopt was that of utilization of waste heat from vapor lines. The vapor heat exchangers now in service were installed six years ago. Prior to that time vapor heat exchangers of a different type were used. This probably marks one of the earliest attempts to conserve waste heat at this point in the Mid-Continent field. It is said that vapor heat exchangers were employed by California refiners as early as 1915, but they did not become extensively employed in the industry until the last three or four years.

Crude charged to the distillation apparatus first passes through three vapor heat exchangers placed on the vapor line of three shell stills employed to condition cylinder stock to flash and fire specifications by the removal of wax distillate and some gas oil in continuous operation. Passing out of the vapor heat exchangers the crude then is conducted through the residuum heat exchangers of a type similar to the former mentioned exchange equipment. The exchanger equipment was made on the plant and consists of two-inch tubes inside of a 24-inch shell and is similar in assembly to the modern tube type exchanger. In this exchange the cold oil is preheated to about 280 F. before it enters the pipe still.

CONTROL OF SPECIFICATIONS

Leaving the pipe still the oil passes into the bottom of a vaporizer column where the vaporized portion passes overhead and through the six towers. There are two pipe still units discharging simultaneously into the same vaporizor or evaporator. Gas oil cut, kerosene, and naphtha are removed by partial condensation from the bottom of the towers. Light gasoline is taken overhead from the last tower in the series.

In order to secure the desired flash and fire specifications of gas oil and kerosene, these two tower-bottom



From the meeting of the Board that Approves to the state of a Cracking Unit that Earns

SMITHWelded Cracking Stills shorten the time that elapses from the date plans are approved until a cracking unit is producing and earning.

First—the facilities of the A. O. Smith Corporation for production of thick-walled vessels in quantities are unequalled in the world.

Second—SMITHWelded Vessels are built to such extreme accuracy that all pipe fitting, setting and superstructure can be prepared in advance with the certainty that there will be no necessity for rebuilding or refitting.

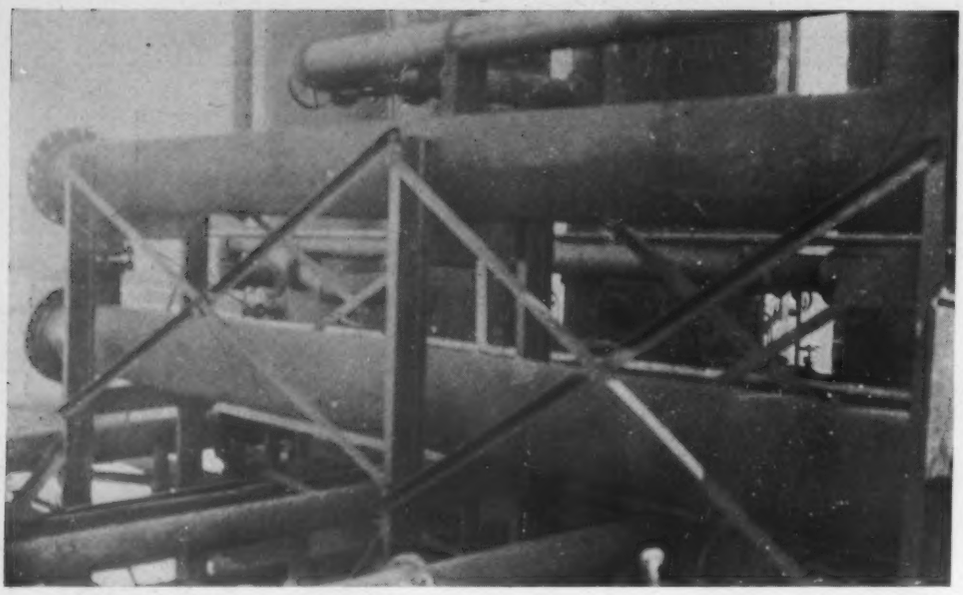
SMITH*WELDED*
CRACKING STILLS

A. O. SMITH CORPORATION, ***General Offices: Milwaukee, Wis.***

OIL AND GAS FIELD PRODUCTS DIVISION

District Offices at New York City, Pittsburgh, Tulsa, Houston, Los Angeles

Mention Where You Saw the Advertisement



Early type of vapor heat exchanger installed at Transcontinental's Boynton, Oklahoma refinery 8 years ago

streams are refluxed into small horizontal stills of the tubular, counter-flow type, where they are passed counter-current to the hot residual oil leaving the bottom of the vaporizor. A small amount of live steam is used in these two stills to assist in driving off any light components present in the gas oil or kerosene. Leaving these chambers these two products are finished.

The residuum, which separates in the vaporizor, after passing through the two horizontal stills, then flows into the three shell stills of conventional type, nearby, where any remaining gas oil and the wax distillate cuts are removed continuously. Leaving these three stills the cylinder stock is ready for the cold settling process where the wax is removed, then to the contact filtration plant where it is finished into bright stock.

Another method of operating this early installation of pipe still and towers involves heating the crude to sufficiently high temperatures in the pipe still to vaporize all the lighter fractions down to and through the wax distillates, leaving cylinder stock as the residuum from the operation. This is, no doubt, one of the earliest pipe still units to distill wax distillate continuously.

Under either method, the wax distillate is taken to separate shell stills and cracked in the conventional manner before being sent to the wax house. The gas oil is finished in the first operation and is ready for market. The gasoline is transferred to the treating plant and sweetened continuously with sodium hypochlorite. The kerosene is chemically treated, using the sodium plumbite method.

WAX PLANT

The lubricating oil plant, or wax plant, is of modern standard equipment. The cracked wax distillate is cooled to zero, passed through the presses and ready for filtering to color. Wax produced by the pressing operation is sweated and filtered and finished to less than one per cent. oil and moisture. An interesting item is noted in the packaging room, in that much of the finished wax is packed in 175 pound bags. The company ships a great deal of wax to certain South American countries where the "legal load for mule or man" is 175 pounds and for this reason the 175 pound bag is used. The remainder of the wax is packaged in barrels and bags of 260 and 210 pounds weight, respectively.

The filter house is designed for convenience and safety. The building consists of five long rooms. The central room contains the conveyor belts and rollers for handling the used earth. On each side of the central room there are other long rooms containing five 11-ton filters, six feet by 26 feet. These filters are enclosed by brick walls. Flanking the two filter rooms and on the outside on each side of the building are two large pan rooms containing the vats into which the filtrates or finished oils flow.

When the earth is spent in the filters they are blown with air, washed with naphtha, steamed for six hours, and the clay is then dumped through spouts onto the centrally located conveyor belt.

The belt conveyor takes the clay into the kiln room and dumps it into a hopper from where a second conveyor takes it to the top of the second hopper from where it feeds into a clay regenerator of the kiln type. This inclined cylindrical kiln is rotated slowly by means of belt drive from a steam engine located in the next room. As the regenerated clay flows out of the lower end of the kiln it passes into a second inclined revolving cylinder which is the cooler. It drops from the lower end of the cooling chamber into another hopper, from which it is conveyed back up to the second floor of the filter house and ready to flow through spouts back into the filters.

Two Carbondale refrigeration plants are employed, one of which works on the wax pressing plant, which consists of three Carbondale wax presses, size 48-inch. The other refrigeration plant works on the cold settling equipment where diluted cylinder stock is chilled to make bright stock. After chilling, the cold oil is taken to a batch still and the naphtha removed. Chemical treatment and contact clay filtration follows in making the finished bright stock.

ACID SLUDGE BURNING

Acid sludge which accumulates from the treatment of heavy oils at this plant is employed as fuel after blending with varying proportions of fuel oil. Because it is more costly to transport the heavy sludge to the stills than it is to pump the acid and the oil to or near the stills, the agitators for treating the heavy oils are both located close to the battery of shell stills where the blend of sludge and oil is burned. The agitators are employed alternately, that is, while one is being employed for treating heavy oils, the other is in service as a fuel tank.

When an agitator full of oil has been treated the oil is

STOP FIRE AND EVAPORATION LOSSES

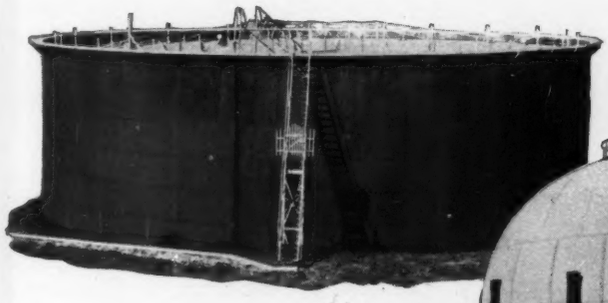
With WIGGINS FLOATING ROOFS

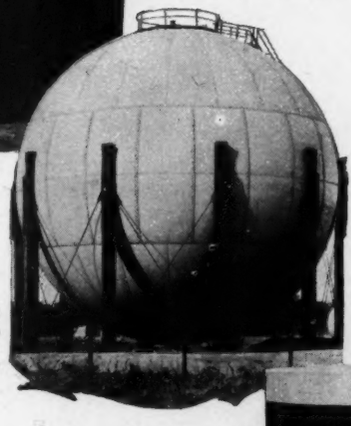
This roof rises and falls with changing oil level, effectively separating oil and air and thereby minimizing the tendency to evaporate and the possibilities of fire. It stops filling and emptying losses and daily breathing. Ordinarily pays for itself in a year or less.

A 25,000,000 bbl. oil loss deserves prompt and drastic action. That's a conservative estimate of the toll taken annually by evaporation.

While the conditions which favor evaporation may sometimes be controlled, it is impossible to stop the operation of this natural law. But the resulting loss of valuable vapor can usually be stopped or at least greatly reduced. The same measures which stop evaporation are also effective in preventing fire.

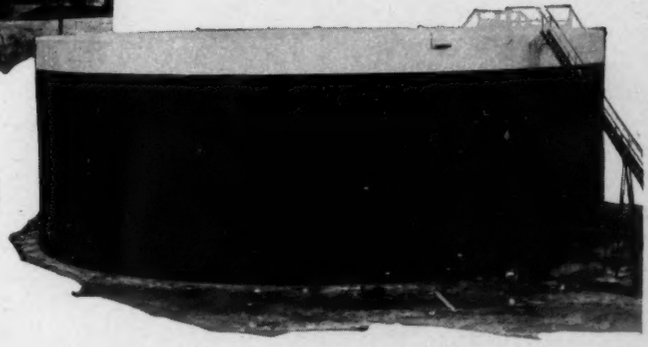
The varying conditions under which crude oil and refined products are exposed to the ravages of evaporation and fire call for different measures to stop these losses. Recognizing this fact, two types of roof for standard tanks and one special type of spherical container are offered. The three sets of conditions under which these three designs are effective cover practically all common practice. We will gladly furnish complete data on these types of equipment and show you lists of the leading companies using them.





or THE HORTONSPHERE *for highly volatile liquids*

This spherical container permits the storage of volatile oil under pressure sufficient to maintain its liquid state.



or WIGGINS BREATHER ROOFS *for standing storage*

This roof flexes up and down with changes in vapor volume. Daily thermal breathing is eliminated in tanks held nearly full, for this roof provides ample flexibility in volume to accommodate the vapor without loss.

CHICAGO BRIDGE & IRON WORKS

Dallas, 3355 Magnolia Bldg.
Chicago, 2463 Old Colony Bldg.
New York, 3102 Hudson Terminal Bldg.
Cleveland, 2234 Union Trust Bldg.
Detroit, 1520 Lafayette Bldg.
Philadelphia, 1608 Jefferson Bldg.
San Francisco, 1051 Rialto Bldg.
Havana, Cuba, Apartado 2507

RNGM-2-Gray

pumped to storage, leaving the acid sludge in the bottom. To this sludge a certain amount of fuel oil is added, blended with it by agitation with steam and the blend employed for firing the stills. The proportion of fuel oil required in the blend is governed to some extent by the type of oil being treated. It is desired, of course, that the volume of oil added be just sufficient to balance with the fueling requirements of the stills.

The acid tar-fuel oil blend flows from the bottom of the agitator cone into the suction side of a Union Steam "Magna" pump which discharges the heavy fuel into a belt line conveying the fuel to the burners, with the excess flowing back to the pump. A pressure of about 40 pounds is sufficient to handle the heavy blended fuel. The burners employed were designed by company engineers and made at the plant. They are designed so that the fuel is atomized by steam as it is sprayed into the furnace. Further, the design is such that very little difficulty is experienced due to plugging of the burner. The volume of blended fuel, as well as the proportion of steam required is regulated by needle valves on the respective fuel and steam lines. Small block valves and by-pass lines are provided for the purpose of cleaning the fuel shaft portion of the burner in the event that they should become plugged. The burner as assembled is easily controlled, simple of construction, and is inexpensive.

Transcontinental has done a great deal of work on acid sludge disposal and is at present engaged in improving its present system of acid tar burning at its Fort Worth refinery. There are a number of advantages apparent in the present system of blending acid sludge with fuel oil and consuming all of this waste product as fuel. It is certainly a marked improvement over older methods of acid sludge disposal, but late experiments have been indicative of better success of handling the sludge through the securing of greater economy in transporting the fuel to the burners.

SAFETY

Throughout the entire plant yard there is much evidence of the strict attention given to making the refinery safe for the operators. Wherever needed steel platforms are provided with sturdy hand or guard rails. These walkways extend over both front and rear of the entire distillation equipment, on all units. They extend out over the run-down tanks for the convenience and safety of the men caring for the tanks. In addition to providing safe steel steps and extensive runways leading to all parts of the condensing and distillation system, the matter of color of such safeguards has been looked into. While all of the equipment is lighted in the usual manner so that night workmen may see their way about safely, it has been found very advantageous to paint all safe guards a very light gray, which at night has a white appearance, especially when in contrast with the black painted equipment surrounding the walkways. The painting of all walkways with white or light gray paint is not prevalent practice in the industry, and for this reason attention is directed to the practice at this refinery for such a policy is certain to lower the hazard for the night worker, especially in the event of failure of the plant lighting system.

The 22-car loading rack is also designed to give as much clearance for working space both below the rack and above as possible. All of the loading lines which carry products to the individual loading risers, are suspended just beneath the loading rack floor, which secures for the employee a clear working space on the ground when he is testing outlet valves and removing "belly caps." The supporting framework is all structural steel.

Natural Gasoline Outlook Brighter

(*Continued from page* 58)

in the natural gas industry that is taking place at the present time, and the discovery of numerous additional gas producing areas, particularly in the Southwest and in California, it is apparent that this year will show further gain in the output of natural gasoline.

On August 31, 1927, natural gasoline manufacturers possessed the largest stocks of this product in the history of the industry, aggregating 41,670,000 gallons. Although production continued to increase each month, the sharp increase in demand by the refining industry, particularly during the latter part of 1927 and throughout most of 1928, resulted in a rapid decline in inventories of natural gasoline. In consequence, the industry entered 1929 with stocks of natural gasoline at the lowest point for a number of years, 16,978,000 gallons. This means that in the space of 17 months, stocks of natural gasoline were reduced nearly 25 million gallons. While the present outlook for the industry indicates that there will be further gains in production during the present year, it is anticipated that the demand for this product, by reason of expanded cracking facilities, will readily absorb the increased output, and undoubtedly bring about further reductions in inventories during the coming summer months.

OUTLOOK BRIGHTER

In summarizing the facts at hand and weighing their influence upon the immediate outlook for the natural gasoline industry, it becomes apparent that the outlook is much brighter. Even though the crude market is still in an unsatisfactory condition, it is believed that the demand for gasoline during the present year will greatly exceed that of last year and will therefore justify further expansion in the refining industry's cracking facilities. However, much depends upon the ability of the refiner to control his still run operations. If diligent vigilance is exercised to prevent running crude in excess of the required output of both straight and cracked gasoline, the refining industry will be in a position to profit from its operations, and the natural gasoline manufacturer will in turn benefit by the improved gasoline market. In view of marked improvements made by the refining industry during the past year, it is logical to expect that any expansion in cracking operations will be offset by a proportionate decline in the amount of crude run to stills. The large surplus of gas and fuel oil at refineries represents a large amount of gasoline and the cracking of this surplus spells a big demand for natural gasoline. The natural gasoline manufacturer has nothing to fear as far as the immediate demand for his product is concerned, but the profitableness of his market depends solely upon the ability of the refiner to prevent another over-production of motor gasoline.

Topping plant and re-run stills, Trinidad Leaseholds, Ltd., Pointe-a-Pierre, Trinidad

Trinidad Would Encourage Location Of Refineries There

By ROY E. LEIGH

PORT of Spain, Trinidad.—Surveyors representing the West India Oil Company, a marketing subsidiary of the Standard Oil Company of New Jersey, have been engaged upon a survey of a proposed refinery site in the vicinity of Pitch Lake, about twenty miles south of the town of San Fernando, Trinidad, B. W. I. It is reported that a small topping plant will be constructed for the purpose of supplying the Standard Oil Company's West Indian trade.

The Standard Oil Company of New Jersey has had a foot-hold in the Caribbean trade for several years; but its sales activities have been handicapped and seriously limited by the inadequacy of its supply of refined products. The operation of the preferential tariff forbids the importation of gasoline and kerosene from the United States; and, although Canadian products manufactured by the Imperial Oil Company were used for a time, it is said that freight and handling costs were found to be prohibitive. During the last few years, Standard Oil Company of New Jersey has seemingly been content to to mark time, maintaining its position as a factor in the West Indian market by the re-sale of gasoline, kerosene, and other products manufactured locally by Trinidad Central Oilfields, Ltd. However, the recent acquisition by the West India Oil Company of all of the outstanding capital stock of Trinidad Oil Fields Operating Company, Ltd., formerly controlled, in part, by financial interests identified with Beacon Oil Company, of Boston, Massachusetts, and Louisiana Oil Refining Corporation of Shreveport, Louisiana, gives to Standard Oil Company of New Jersey an assured source of crude supply; and it is considered likely that the current year may bring about the fruition of plans laid several years ago when Standard Oil Company of New Jersey first invaded this British stronghold.

Heretofore, the Caribbean market has been dominated by New Trinidad Petroleum Warehouses, Ltd., a marketing organization popularly known as "the Gasoline Pool," controlled by the Royal Dutch Shell interests, which distributes gasoline, kerosene, and other products manufactured locally by Trinidad Leaseholds, Ltd., of Pointe-a-Pierre, and United British Refineries, Ltd., of Point Fortin. Lubricating oils and greases manufactured in the Shell refinery at Curacao, D. W. I., are also handled by the gasoline pool. It is generally understood in local oil circles that the juicy West Indian market is shared between Leaseholds and United British under a pooling arrangement, operated by New Trinidad Petroleum Warehouses, Ltd., and believed to be based on the crude oil production of each. It is significant to note that the retail price of gasoline seldom, if ever, fluctuates, having been maintained for several years at a steady price of 40 cents per

Topping plant of United British Refineries, Ltd., at Point Fortin, Trinidad. It is operated by United British Oil Fields of Trinidad, Ltd.

Imperial gallon, which includes an excise tax of 12 cents.

It is understood locally that the West India company will not accept membership in the Gasoline Pool; and the outcome of direct competition between these foremost British and American groups is being awaited with the keenest interest.

Further significance is attached to this recent development by those who foresee the possibility that the West India Oil Company's proposed plant in Trinidad may in time become the nucleus of a large refining center, destined to handle crude oil produced by the Standard Oil Company of Venezuela in eastern Venezuela, just across the Gulf of Paria from Trinidad, where exploratory drilling following an extensive geophysical survey, has resulted in the completion of two producing oil wells. Trinidad, a British Crown Colony which enjoys a stable government, an equable climate, and excellent harbor facilities, occupies the same position with respect to the Maturin-Guanoco District, in eastern Venezuela, as do Curacao and Aruba, Dutch Islands, situated a short distance north of Lake Maracaibo, with respect to the Maracaibo District. A very considerable portion of the oil produced in the Maracaibo District is brought to these points for refining.

Sir Thomas H. Holland, K. C. S. I., K. C. I. E., F. R. S., Director of the Imperial College of Science and Technology, and ex-President of the Institute of Petroleum Technologists and Mining Engineers, who was sent out by the Colonial Office to make an investigation of Trinidad's oil industry last year, also foresaw this opportunity confronting Britain's most important West Indian colony; and in his report which will be considered by the Legislative Council in March, he strongly recommends certain legislative action designed to attract investments in refining plants.

Under the heading "General Impressions," Sir Thomas says, "A satisfactory feature of the industry has been the development of domestic refining;" and, "—it is evident that definite commercial advantages have followed—."

At present crude oil from British territory comes under the general import tariff of 10 per cent. *ad valorem.* This, and heavier duties imposed on oil of non-British origin, is recognized as a deterrent to the scheme which Holland proposes; and, after pointing out that, so far, only small lots have been imported for special purposes he takes up the broad question:

"(1) Is it desirable to encourage the importation of crude oil for local refineries?

"(2) Would the importation of outside crude oil tend to reduce activity in developing the Trinidad fields?"

In a preceding section of his report, Sir Thomas warned the Home Government and the Local Government that "the exploitation of petroleum is directed towards the ultimate depletion of a natural asset of vital importance which, unlike an agricultural product, cannot be reproduced. Nor is it too early to take stock of the position,—" "—it would probably not be rash to assert that the peak of production in Trinidad will be attained within the next 10 to 15 years, and that from then onward one field after another will show signs of exhaustion, without being effectively replaced by others; local refineries will then have to look to outside sources of crude oil to justify the continued maintenance of their operations." The eminent English expert develops his theme as follows:

"There can hardly be much difference of opinion rearding the beneficial effects of the refining industry, and it is hoped that Trinidad will continue to be regarded as a suitable site for a refining industry after, and long after, its own fields are exhausted of their reserves. When the decline of the local fields occurs, it will certainly be to the general benefit of the Colony to encourage the importation of crude oil; and it is important to consider whether it is wise now to anticipate that time by the immediate removal of the import tariff on crude oil.

"One of the most important circumstances to consider in this respect is the influence of a proved stability of fiscal policy. In the Central American region there is already a striking example of the way in which commercial investors are affected by considerations of political stability in selecting a site for refinery works. Trinidad has an opportunity now of showing that it is a safe area for the investment of capital in refinery plant to handle the prospective supplies being developed in the Central American region. The two controlling phases of

fiscal policy in this respect are the Government's attitude with regard to the tariff on imported crude oil and that on exported products.

"The proposal to impose an export duty on oil—crude and refined—has already been discussed, and there seems little doubt that this proposal would not only fail to earn additional revenue, but would check the investment of capital in refinery extensions. To estimate the effect of the other proposal, namely, the removal of an import tariff on crude oil, one must take into account also its effect on the local field operations.

"Evidently under present conditions there is no temptation for the refining companies seriously to cut down their local activities in the field. The largest of the refiners cannot reduce its output of crude below 133,333 tons a year without paying a higher rate of royalty, and all have contracted to pay a minimum annual royalty on the lands that they have leased. So long therefore as the refiners are lessees of oil-lands, the government is insured against slackness in field work, even if crude oil were obtainable more cheaply from outside sources.

"Nor would it be safe commercially for any of the refining companies to give up their oil-land leases; if they did so, they would be unable to deal on equal terms with other crude-oil producers, local or external. There is always a danger that in any of the states in this region that might be regarded as sources of crude, restriction on export may be imposed at any time for political purposes. It is thus essential for each of the refining companies to hold a reasonable amount of oil-bearing land, which the minimum annual royalty compels them to develop at a specified rate. It is but another example of the fact that the minimum annual royalty, or dead-rent, is the most important condition to be determined in the grant of leasehold concessions.

"And taking the long view, it is important that the dead-rent should be sufficiently moderate to permit of methodically deliberate developments. The longer the fields last, the more they will produce; and the longer the fields produce, the longer will the refinery business be in a stable position and able to deal on equal terms with external supplies of crude oil.

"Thus there appears to be no danger in removing the existing import tariff on crude oil; on the contrary, there are obvious advantages to the well being of the Colony in declaring this to be the settled policy of the Government, having in view the maintenance of the refining industry and the increased longevityof the oil fields."

In conclusion, he makes the definite recommendation that "It is advisable to admit crude oil free of import tariff, and, with a view of establishing the oil-refinery industry, to declare this to be a part of the settled policy of Government."

The action of the Legislative Council will be awaited with greatest interest throughout Britain and America, as it would appear that Trinidad's law-making body is confronted with the task of weighing the interests of the Shell combine against those of an important British colony, which seem intimately to parallel those of the Standard group.

ROY E. LEIGH

Roy E. Leigh has recently joined the staff of the Gulf Publishing Company publications for the special purpose of making a world survey of oil. In this work he will visit all the oil producing countries of the world. Previous to this connection Mr. Leigh spent two years in Trinidad with Trinidad Oil Fields Operating Company, and the accompanying article is written from material gathered during that residence. He is now en route to South America for a trip which will take him to each oil center on that continent, after which he will visit other foreign fields. From time to time, articles on the economics of the refining industry in the countries he visits will appear in THE REFINER AND NATURAL GASOLINE MANUFACTURER.

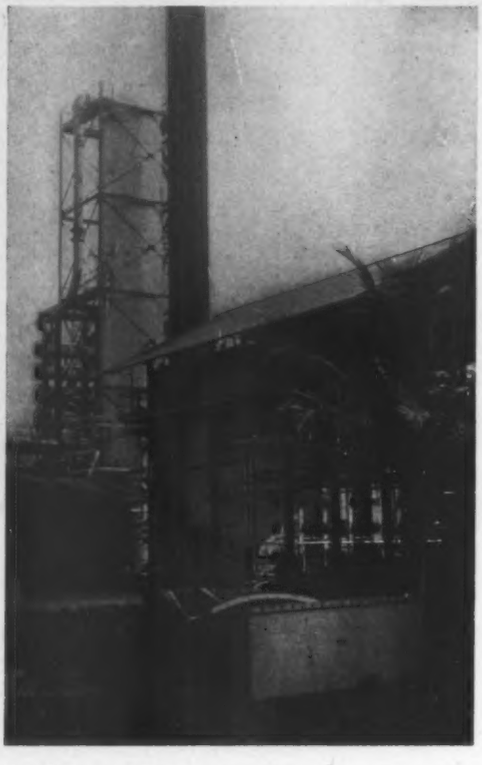
REFINERY PROFITS

Sir Thomas considers complaints uttered by local consumers who protest against the high cost of gasoline; and, in one section of his report devoted entirely to refinery profits, practically gives refiners a clean bill of health by explaining that price levels are lower in Trinidad than in neighboring British colonies, and that Trinidad's 40 cent price includes an excise tax of 12 cents per gallon. His treatment of this subject is as follows:

"As the field operations show a loss for all except one of the companies, it is obvious that others who paid dividends have been able to do so from their refinery profits. Trinidad Leaseholds, Ltd., is, however, the only company that has given a fair return so far on its capital investment. The United British Oilfields, Ltd. paid for the year 1926 its first dividend of 7½ per cent. on a written-down capital. The others are not yet above datum line.

"From the point of view of the Colony as a whole, it is obvious that local refining is economically a favorable phase of the oil industry. The export of oil in the crude state was in 1927 only just over 10 per cent. of the total output of the year, and all of it was the product of private lands, most of it raised by an American company that is not yet justified by its output of crude to consider the question of laying out the heavy capital required for a local refinery.

"Except by reviewing their balance sheets, it is not possible to form any idea whether the Companies are or are not making undue profits at the expense of the local consumer of refined products, but the assertions freely made seem to disregard the fact that, in the sale of products, the refining companies are faced by competitors in the open market, for the excise duties and the import duties on products from British sources are the same, namely, 12 cents a gallon on kerosene and motor spirits. There is, how-



Double unit Dubbs Cracking Still, Trinidad Leaseholds, Ltd., Pointe-a-Pierre, Trinidad

ever, a 7½ per cent. surtax on imports, but this amounts to less than a cent a gallon.

"The assumption that unduly high prices are being charged by the local companies, raises the question of why refined products are not imported for sale. It is asserted by their critics that whilst the local companies are protected by a 24 cents' import duty on non-British products, they have a marketing understanding with the larger British companies outside. This, however, does not apply to products that are refined or partly refined in Canada from American crude oil. Small quantities of products which satisfy the quarter-British qualifications for a favored rate have at times been imported, but obviously Canadian refiners have not regarded the local market very seriously at the prices which have prevailed for the past few years.

"One reason for the impression that local prices are unduly high obviously arises from the excise duty of 12 cents a gallon, and comparisons have been made also with the retail prices in Barbados, without recognition of the fact that the old wine gallon is used there instead of the larger Imperial gallon, which is the unit in Trinidad.

"There seems little doubt that retail prices of motor spirit per Imperial gallon have for some years been at a higher level in Barbados and Demerara than in Trinidad, and the local companies assert that for their products exported to these other markets they obtain a slightly higher margin of profit than on local markets.

"It seems obvious that there is no discrimination against the local consumer, nor, in the face of possible competition, would it be practicable. It is certain that the companies do make profits, and if they did not do so, the refineries as well as a large part of the oilfields operations would close down; but that there is profiteering in any real sense is in no way supported by the facts.

The Holland report also provides the following interesting statistics on the exportation of refined products from Trinidad:

Export of Fuel Oil From Trinidad

Year	Quantity Gallons	Value £	Value per gal. Pence
1918	27,920,015	263,709	2.26
1919	30,355,986	309,311	2.44
1920	27,349,853	345,383	3.03
1921	33,781,450	394,586	2.80
1922	39,475,864	404,228	2.46
1923	61,722,795	711,518	2.76
1924	87,033,350	904,358	2.49
1925	99,525,178	1,091,169	2.63
1926	105,175,686	1,128,518	2.57
1927	110,312,796	1,194,076	2.59

Exports of Kerosene From Trinidad

Year	Quantity Gallons	Value £	Value per gal. Pence
1918	2,018,455	26,068	3.09
1919	2,109,874	146,564	16.66
1920	1,870,861	79,568	10.20
1921	1,993,821	89,883	10.81
1922	2,152,625	66,977	7.46
1923	1,262,228	46,397	8.82
1924	803,304	23,854	7.12
1925	2,735,831	60,160	5.27
1926	857,391	33,861	9.47
1927	1,324,965	57,816	10.47

Exports of Gasolene From Trinidad

Year	Quantity Gallons	Value £	Value per gal. Pence
1918	2,741,622	141,968	12.42
1919	2,419,744	147,291	14.60
1920	2,420,821	141,128	13.99
1921	2,762,435	173,367	15.62
1922	5,463,036	221,270	9.72
1923	10,527,702	354,027	8.07
1924	13,463,461	361,864	6.45
1925	13,425,650	343,184	6.13
1926	20,799,384	612,348	7.06
1927	28,444,066	951,666	8.02

Exports of Lubricating Oils From Trinidad

Year	Quantity Gallons	Value £	Value per gal. Pence
1918	72,859	3,387	11.15
1919	8,501	427	12.05
1920	Nil	Nil	Nil
1921	Nil	Nil	Nil
1922	6,812	598	21.06
1923	14,418	457	7.60
1924	3,269	159	11.67
1925	28,064	1,666	14.24
1926	7,061	609	20.70
1927	5,752	332	13.85

In considering potential sources for increased

revenue, Sir Thomas predicts that the imposition of an export tax on crude oil would shortly defeat its own purpose by killing off the export trade in that product. He says that "Fuel oil is worth only about (3£) a ton at Trinidad ports; it could not stand an appreciable tax without curtailment of the export trade, and, in any event, the tendency is to restrict its production by improved 'cracking' processes." Of kerosene, he says that it "is relatively a small trade, and is open to attack by imports; consequently, as the figures show, its trade is subject to considerable variations from year to year, which reduce its value as a trustworthy source of revenue. The kerosene imported, mainly of a grade high enough to pay the import duty has varied during the past five years between 87,310 and 219,068 gallons annually." "Lubricating oil is far too small to consider, and the figures show also that the external trade in it is variable, a feature which condemns it as a reliable source of revenue."

Therefore, according to this authority, "The problem thus narrows down to one of taxing exported gasoline. At present the local refiners are facing powerful competitors in external markets, but are able to retain a footing partly by having financial relatives among outside manufacturers; a tax, however, on a scale estimated on present figures to bring in any substantial revenue might quickly limit the market for Trinidad gasoline to the West Indian region, which absorbs only one-tenth of the production, and thus it might react disastrously on the industry itself as well as fail in its direct object to earn revenue."

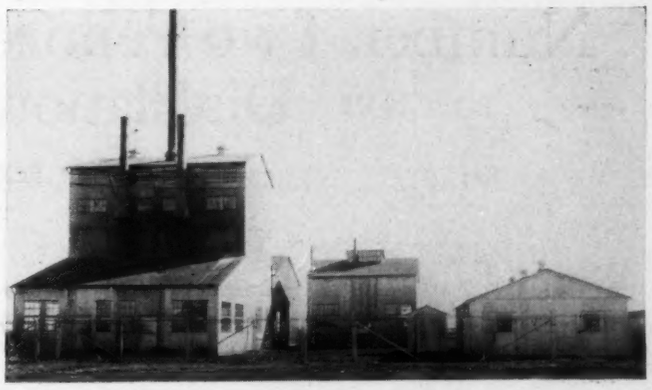
Smokeless Carbon Black Process Operating

AFTER six years of research and experimental work the General Atlas Chemical Company, a subsidiary of the Cities Service Company, has perfected a smokeless process for the manufacture of carbon black. The first commercial plant erected for the preparation of this type of carbon is in operation near Pampa, Texas. The product of this first unit is marketed through the Grasselli Chemical Company, Cleveland, Ohio, which was recently acquired by the E. I. Du Pont de Nemours & Company, under the trade name are of "Gastex."

The owners of the patents covering the new process are not making public the details of operating methods with the exception of the statement that the process involves the partial combustion of natural gas. The process and equipment patents are owned by the General Atlas Chemical Company. The present plant at Pampa is given a capacity rating of 10,000 pounds carbon black daily. Another interesting fact in connection with this installation is found in the fact that the carbon black is produced from a sulphurous natural gas, the plant being located on the eastern edge of a sulphurous gas field, and it is claimed by the owners that this smokeless process is the only one which can be successfully used in the manufacture of carbon black from sulphur bearing gas.

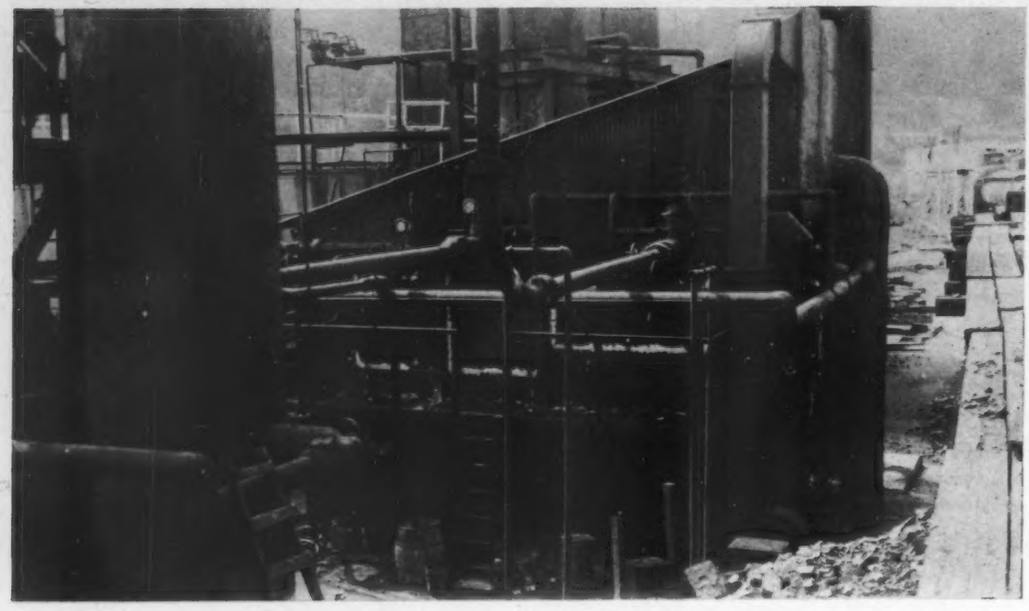
Empire Gas & Fuel Company, also a Cities Service subsidiary, has erected and is operating an absorption type natural gasoline plant one mile north of the carbon black plant. The gasoline unit is a Southwestern Type 25, operating under well pressure of around 40 pounds per square inch. This gas is comparatively lean, as it has a gasoline content of but .35 gallons per thousand cubic feet.

The "Gastex" type of carbon has so far found its greatest use in rubber compounding. It is a different type of carbon black than has yet been produced. It has but about 50 per cent. of the color of carbon black produced by the channel process, and is therefore not utilized in the preparation of pigments to any large extent. It is claimed, however, that when used in the compounding of rubber the stock will cure faster, and such stocks show remarkable aging capacity. In physical properties, such as apparent density, "Gastex" is 0.384 as compared with 0.2 for channel black, which makes for easier handling of the finished product. The actual specific gravity is 1.82 as compared with 1.76 for channel black. The ash content is given as about 0.08, which is low, and compares favorably with other types of black. Moisture content is between 0.1 and 0.3 per cent. and varies little with atmospheric humidity changes. Acetone extract of "Gastex" ranges from 0.2 to 0.6, and averages about 0.5 per cent. In color the "Gastex" black is called a "blue-black," as compared to the "brown-black" of the channel process. In the process for the manufacture of "Gastex" both the flow of air and gas is carefully controlled, which results in the production of a very uniform product. It is said that the color difference is of little importance in the preparation of rubber compounds containing 30 to 40 parts of black.



Smokeless Carbon Black Manufacturing Plant

The process now being employed at Pampa was worked out on a small scale at the Toledo, Ohio, plant of the General Atlas Chemical Company. It is not planned to issue permits to other users on a royalty basis as the new smokeless process is designed to find its place in the activities of several of the Cities Service subsidiaries. Because of increase in recovery of black from the natural gas, and lower cost of production, the new black is marketed at a lower selling price than are the regular blacks.



2800 *Barrels of pressure distillate is charged to this small tube still daily for redistillation at Pennzoil Company's No. 2 refinery, Oil City, Pennsylvania*

Number Two Pennzoil Plant Offers Modern Distillation Equipment

By GEORGE REID
Associate Editor

AT Plant No. 2 of the Pennzoil Company at Oil City, Pennsylvania, there is no lubricating oil department, the entire plant being given over to skimming, cracking, redistillation, chemical treatment of the lighter fractions. Two Dubbs units comprise the cracking equipment. While they have a rated capacity of 1000 barrels each, they are handling a through-put of 1500 barrels each.

A recent addition at this plant is the absorption type gasoline recovery plant designed by the Burrell-Mase Engineering Company.

Redistillation of the pressure distillate is accomplished by the use of a tube still and bubble tower fractionating equipment, one of the few of its kind in operation. The unit was designed and installed by E. B. Badger and Sons Company. It is an example of the modern trend toward elimination of the shell still in refinery practices.

Pressure distillate from storage is charged to the pipe still through a heat exchanger of conventional type, employing residuum from the separator and bubble tower combined, as the heating medium.

The heated charged oil then passes into a Ross vertical vapor heat exchanger placed on the vapor line leading from the top of the tower to the condenser coils. In the exchangers the fresh oil is preheated to about 230 F. before it enters the first tube bank in the pipe still.

Three banks of tubes are provided in the Badger pipe still, of which two are used for the oil fed to the still, the third being employed as a reboiler tube bank. Passing into the first tube bank the oil flows progressively through the coils and into the second tube bank at the rear of the still. A temperature of around 380 F. is carried on the pipe still, which varies according to the end point of the gasoline desired. The tubes are 2½-inch in diameter, and equipped with latest types of removable return bends. A full set of radiant heat tubes is provided for each tube bank.

Leaving the still, the oil is conducted to the side of the bubble tower and flashed into it, at about the center. This bubble tower is of the type which separates, reboils and fractionates, in the single piece of equipment. As the heated oil enters the tower it is flashed with a small amount of steam, which gives an effect similar to steam distillation. Just above the plate where the oil enters the tower an inverted umbrella device is installed, which is provided with a 12-inch hole in the center. The plate in question is not provided with bell caps. The umbrella device knocks back any entrained heavy particles.

The vapor then rises through eight bubble trays in the upper compartment of the tower, which is termed the rectifying section. The end point of the finished gasoline and the temperature of the tower is controlled by recycling cold finished gasoline over the top of the tower. From the uppermost section of the tower the vapors pass into the vapor line and are conducted downward, to again flow upward through the Rass vapor

The "junk heap" is the most graphic symbol of American prosperity

The refiner who hesitates to junk obsolete equipment and install the newest and most efficient, soon lags behind and is lost in the dust of prosperity, or drowned in his own fuel oil

Millions of dollars worth of earlier refinery equipment has been made obsolete by the Dubbs Cracking Process — while its operation is putting many more millions back into the pockets of the refiners who are using it

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

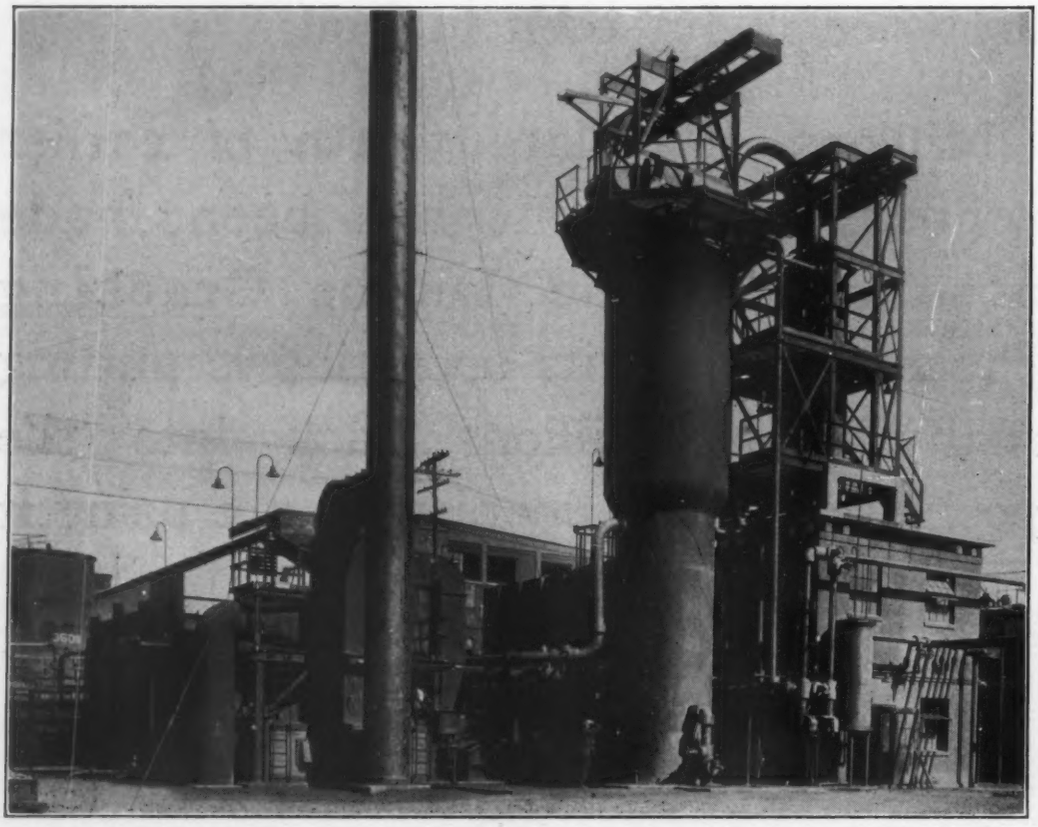
WHY-WHY

have seven of the largest refining companies in the world purchased eighteen complete Badger units, (including, of course, pipe-heaters) in the past four months? Four of these companies had never purchased complete units before.

The answer is simple and apparent.

As one refiner said to us:

"We consider that the Badger Company knows more about fractionating equipment than any other concern."



E.B. BADGER & SONS

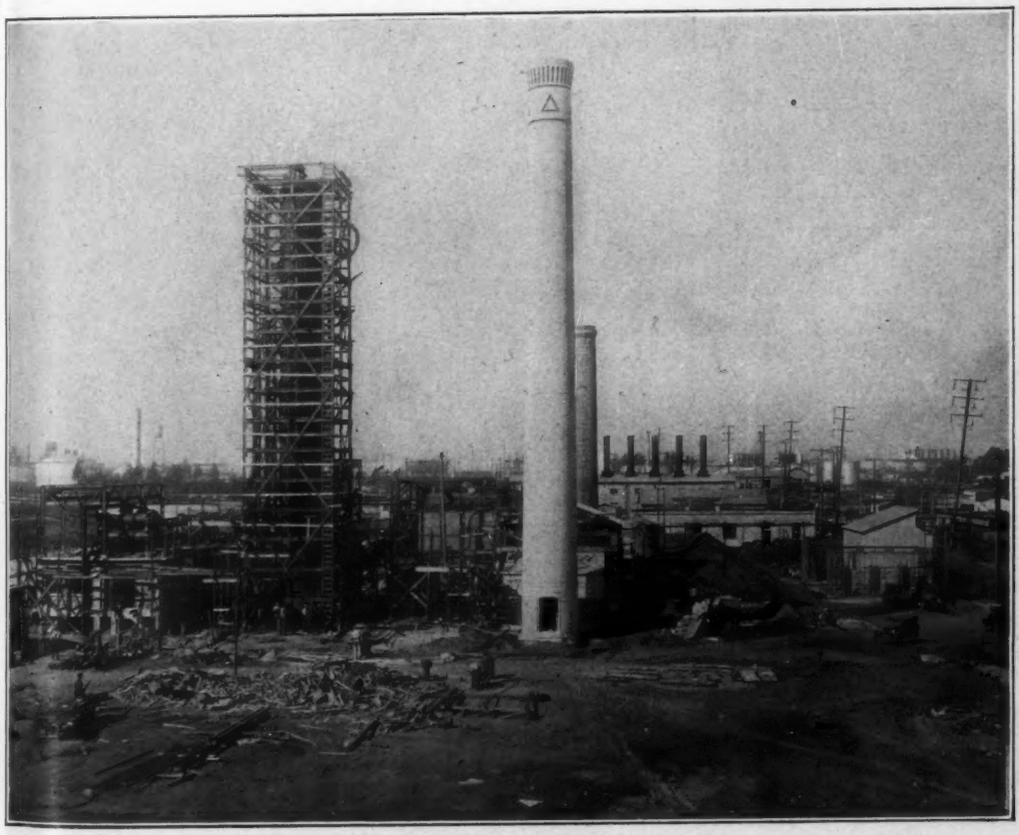
NEW YORK **TULSA**

Mention Where You Saw the Advertisement

WHY-WHY

The complete units referred to cover every phase of refining and include plants for:

TOPPING
ATMOSPHERIC DISTILLATION OF LUBRICATING OILS
VACUUM DISTILLATION OF LUBRICATING OILS
REFINING OF PRESSURE DISTILLATE
REDUCTION OF PRESSED DISTILLATE
RERUNNING CENTRIFUGE SOLUTION

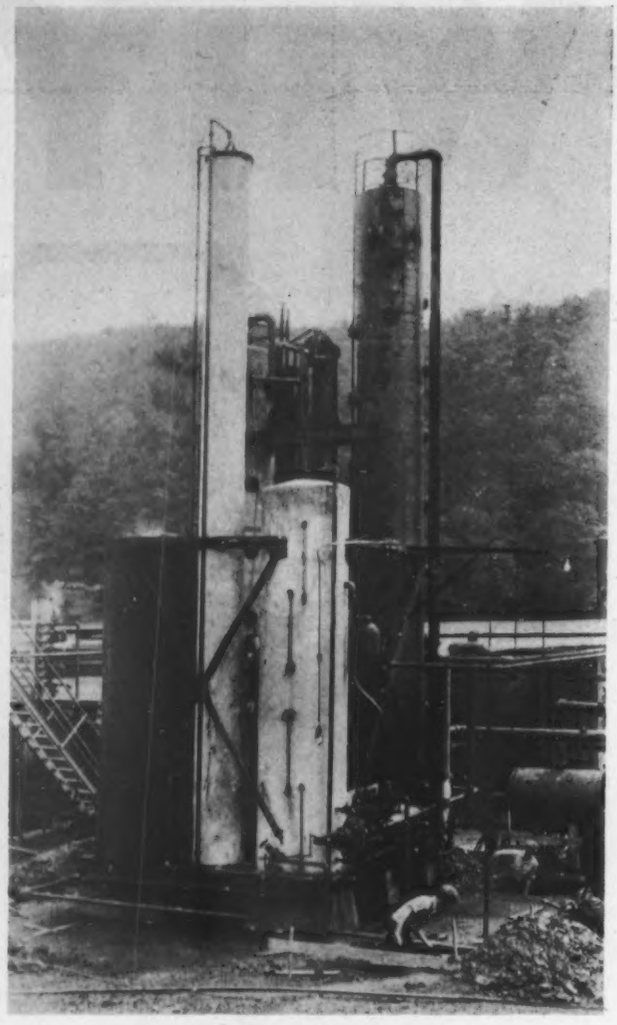


The following Companies are some of those who have purchased BADGER Equipment:

Magnolia Petroleum Co., of Texas
Roxana Petroleum Corp.
Craig Oil Co.
Freedom Oil Works Co.
Texas Pacific Coal & Oil Co.
Gulf Refining Co.
Skelly Oil Co.
Phillips Petroleum Co.
Pierce Petroleum Corp.
Tide Water Oil Co.
Anglo-Persian Oil Co. Ltd.
Empire Refineries, Inc.
Marland Oil Co.
Vacuum Oil Co.
Associated Oil Co.
Barnsdall Corp.
Humble Oil & Refining Co.
Tidal Refining Co.
Standard Oil Co. of N. J.
General Petroleum Corp.
Beacon Oil Company
Lubrite Refining Co.
Pennzoil Company
Shell Company California
New Orleans Refining Co.
Emlenton Refining Co.
Independent Refining Co.
Richfield Oil Co.
The Texas Co.

COMPANY

LOS ANGELES **BOSTON**



Note the compactness of design, and the small space required on the yard, for this 3000 gallon daily capacity, absorption type gasoline recovery plant

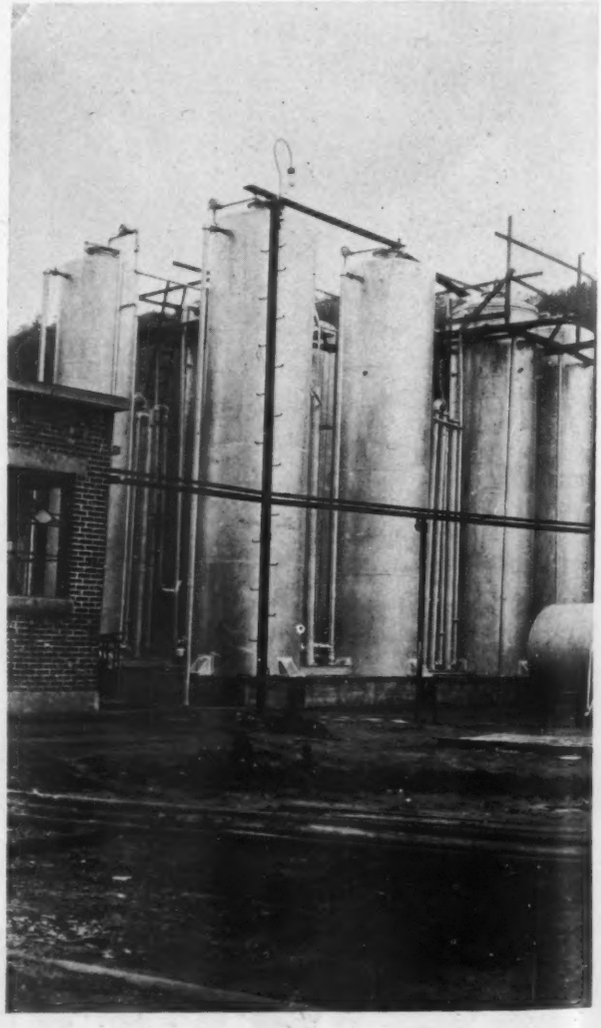
heat exchanger countercurrent to descending fresh charging stock. Further dephlegmation is secured in this part of the process, with the reflux conducted back into the large tower. Leaving the exchanger the vapors pass into the condensing coils, to receiving house and run-down. Through this rectifying column a 10 degrees negative gap between end point of the gasoline, and initial of the residuum is secured.

TOWER OPERATION

A portion of the residual oil accumulating in the bottom section of the tower is taken by pump and discharged through the second tube bank in the pipe still, called the reboiler tube bank. This oil is heated sufficiently to act as reboiler medium when it again passes into the lower section of the tower to flow downward over the six bubble cap trays which are provided in the reboiler section. This additional heat, together with the steam used in the tower, tends to effect a closer separation and to reboil any of the lighter particles which may condense when the heated charging stock is flashed into the separator section.

As the residue accumulates in the lower part of the tower it is removed by pump through the liquid heat exchanger equipment, cooled and taken to storage. A fisher liquid level regulator controls the residue pump and maintains a constant level of oil in the bottom of the tower. All of the seven pumps, three of which are auxiliary, required for the operation of the tube still and fractionating equipment, are National Transit. No control devices are required for the pump handling the portion of the residue utilized as reboiler material, and it is hard regulated. The temperature of the rectifying section of the bubble tower is controlled through a Leeds-Northrup automatic temperature recorder-controller, which governs the volume of cold gasoline sprayed into the top of the column. The tube still equipment was designed to handle 1800 barrels daily, but it has been operated for some time at a figure much above its capacity rating. The pressure distillate charged to the unit is taken from storage after settling following acid treatment in the continuous treating plant.

The small tubular retort equipped with the small tubes has the appearance of a unit erected and designed for much smaller capacity than 1800 barrels, and this still processes as much as 2800 barrels of comparatively light pressure distillate daily. The small tubes, in which a



Two continuous treating plants at Pennzoil Company's No. 2 refinery, Oil City. Pressure distillate is acid treated in the first four columns shown. The system in the background treats finished gasoline only

FISHER

Since 1880 FISHER has advanced every new step in the gas and oil industry by the building of devices to assure accurate and efficient control with economical operation. Their development of such dependable equipment has raised automatic functioning to the "nth" degree. FISHER devices are not considered as "pieces of machinery" — they are SYSTEMS—accepted standards of known service and guaranteed satisfaction. FISHER'S engineering department—technical men with many, many years of gas and oil field experience—offer you a consulting service of rare value—why not consult with them?—there's no obligation.

In the "gas regulating" field FISHER has achieved the apex of mechanical perfection and performance in their regulators. Built in a wide range of sizes and types for all services.

The Fisher Governor Co.
1300 Fisher Bldg. Marshalltown, Iowa

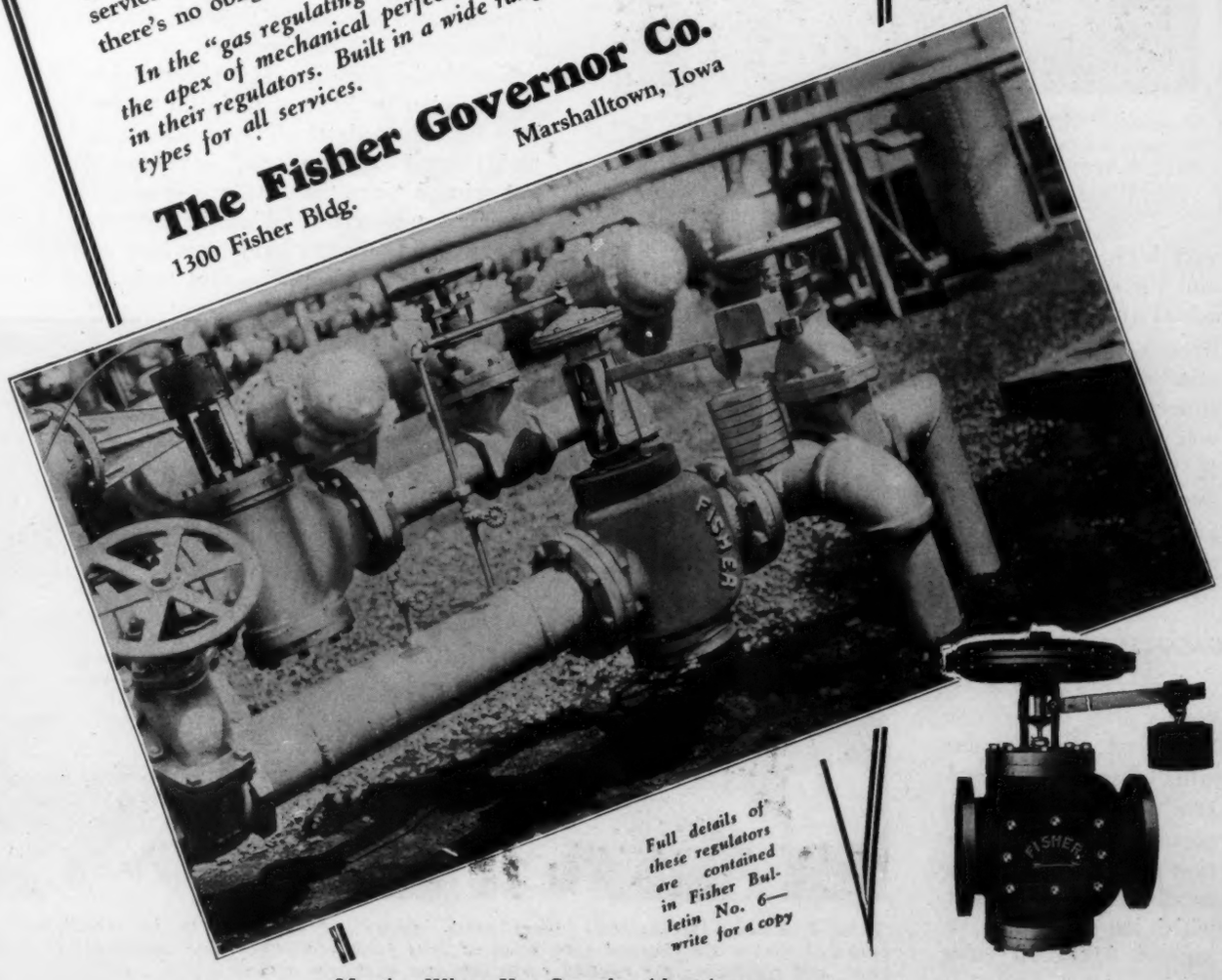
FOR ALL SERVICE

Low—Medium or High Pressure Gas Reducing Valves or Regulators

Type No. 210 (Low Pressure) —for reducing the gas pressure in distribution mains, reinforcing lines, or service mains. Will maintain a gas pressure of a few ounces regardless of normal pressure pulsation on the inlet side of regulator. Also used to control the gas pressure to burners under boilers, etc., and are particularly adapted for gas distribution systems in cities, power plants, etc. Simple in design, has few working parts, and is ruggedly built for severe service.

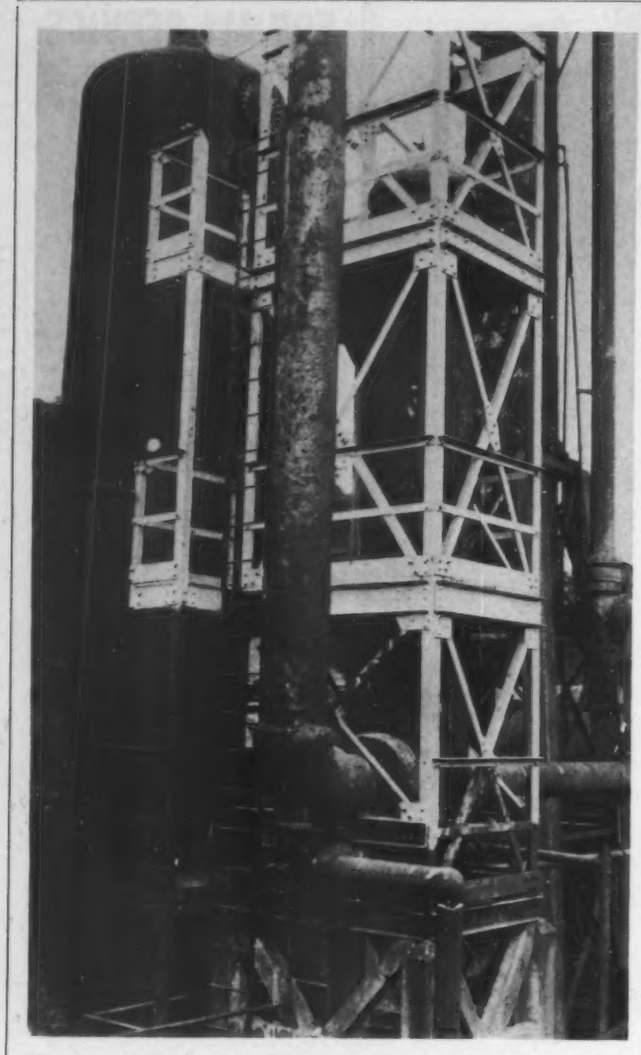
Can be equipped with an Automatic Throwout Link if desired. If initial pressure is lost by bursting of mains, freezing of pipe lines or thoughtless closing of supply valve, the "throwout" device acts allowing valve to close which prevents further flow of gas with the recovery of pressure. Regulator remains closed until reset by operator.

Type No. 211—a medium or high pressure regulator used to reduce the well pressure of natural gas. The well or rock pressure is often too high for delivery to the transmission pipe line. With either natural or artificial gas, a pressure of a few pounds is usually carried in the distribution lines or service mains. This pressure is maintained constant by reducing the supply pressure to the desired pressure in the service mains. Such regulation insures the efficient operation of the gas meters and low pressure regulators.



Full details of these regulators are contained in Fisher Bulletin No. 6—write for a copy

Mention Where You Saw the Advertisement



Showing vertical vapor-heat exchanger, and portion of bubble type fractionating column used in conjunction with pipe still for rerunning pressure distillate from the two Dubbs cracking units

very high velocity of flow through the unit is secured, and the operating temperature obtained with but little actual firing, is characteristic of the stills operating in the Eastern territory. This type of unit was designed by Dr. E. H. Leslie, formerly with the Badger organization and now with the new engineering company of Smith & Leslie, Inc.

GASOLINE RECOVERY

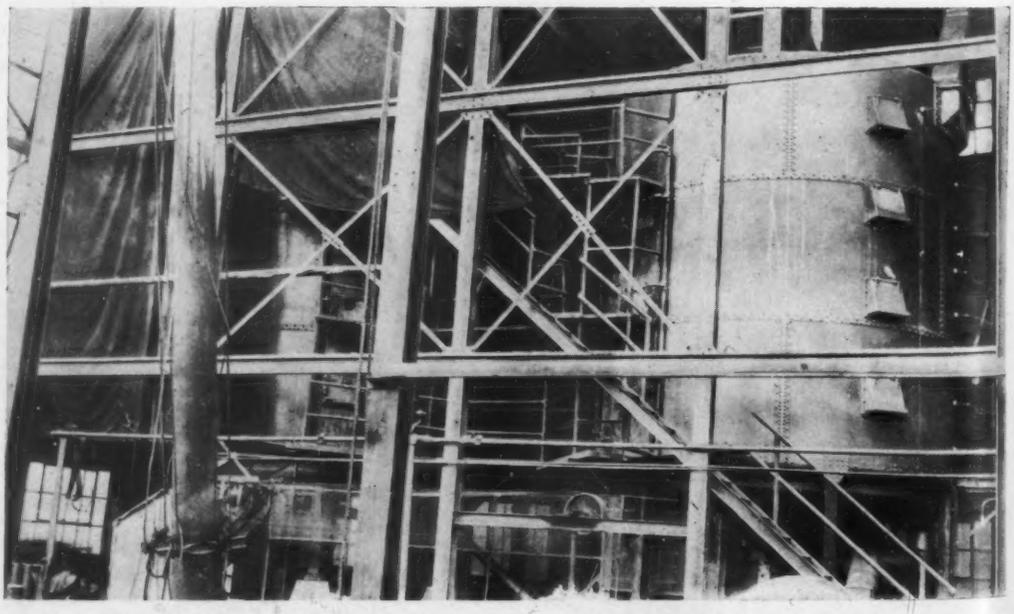
A modern gasoline recovery plant has been installed at this refinery which incorporates modern engineering principles in portable absorption gasoline plants. The small compact unit, which has a capacity rating of 3,000,000 cubic feet of one gallon gas daily, was designed and installed by the Burell-Mase Engineering Company. This plant processes all of the gases and vapors derived from the skimming and rerunning operations, as well as the vapors from all of the light oil storage tanks on the plant yard. It is planned to transport gases from the skimming plant operation at plant No. 1 down to this absorption plant in the near future. The unit also handles the gases from the two Dubbs cracking units.

An Ingersoll-Rand, 17 x 10 x 10 compressor handles all of the vapors from tanks on the plant yard and from the receiving houses, boosting them to the plant operating pressure of 30 pounds. Just outside of the compressor house the compressed gases are united with those coming from the Dubbs units at the same pressure. From this point the combined gases and vapors pass into a small scrubber tank where heavy material from the Dubbs Units is knocked out and drained away.

Leaving this scrubber, the vapors then pass through a horizontal tank 20 feet long and four feet in diameter, which is maintained about half full of 12 Baume caustic solution. An ingenious arrangement of perforated inlets lines, with a perforated umbrella like device laid parallel and above the inlet line, secures the dividing of the gas into numerous small streams, in which manner it passes upward through the caustic solution, which in turn, effects the removal of hydrogen sulphide from the gas charged to the plant.

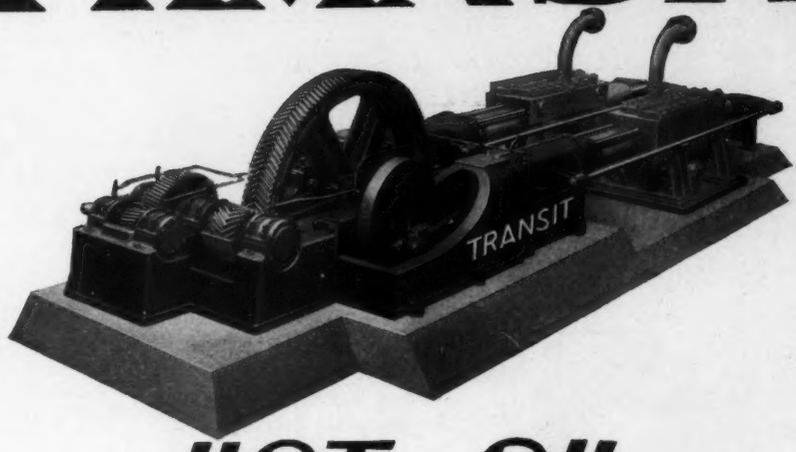
A six-inch line conveys the vapors from the treating tank to the bottom of the absorber, where it passes upward through a series of 14 large single cap bubble trays, countercurrent to the descending absorption oil. The dry gas passes off through a six-inch line to the boilers where it is used as fuel.

Enriched absorption oil is pumped from the bottom of the absorber to the vent tank, the pump being regulated by a Fisher regulator. The vent tank, and another small tank termed the "run tank," have the appearance of but one column, since the vent tank is mounted on top of the other, as a means of making the unit more compact. The accompanying illustration shows how compactly the unit is constructed. From the vent tank the rich oil passes



A third Nichols-Herreschoff fullers earth burner is being added to this installation. The two furnaces shown are charged with balanced split feed using the same equipment to feed both at once, and combining the roasted earth into one conveyor system

Thirty two of these TRANSIT



HOT OIL PUMPS

For One KELLOGG

Refinery.... Installation

National Transit Pump & Machine Co.
OIL CITY, PA.

NEW YORK CLEVELAND PITTSBURGH PHILADELPHIA
LOS ANGELES TULSA HOUSTON

Physical Properties of Paint

The two important components of paint are the vehicle and the pigment for upon them depend the life and wearing quality of the paint.

THE VEHICLE

Of all paint vehicles, linseed oil is recognized as the best and most suitable to withstand wear and exposure. Even if used alone, linseed oil provides a certain amount of protection as it adheres strongly to the surfaces on which it is applied. But this film soon wears away under the elements and abrasive action of dust, etc.

To increase its wearing capacity this film is made stronger by the addition of some solid substance known as the pigment.

THE PIGMENT

Where the preservation of metal surfaces is the main object, first consideration should be given to a pigment that aids in preserving the original elasticity or "life" of the oil.

The pigment *must* be inert—that is, it shall not undergo any chemical change in use because such a change must cause the film to become pervious and lose its protective power.

The thickness of paint films is limited. Beyond a certain thickness the paint runs, or in drying forms a tough skin on the outer side leaving the inner portion soft. By preventing the access of air to the under parts this outer skin retards and even prevents thorough drying.

FLAKE GRAPHITE AS A PIGMENT

Flake Graphite has proved, by far, to be the best pigment for metal protective paint. It is the only one of the carbon family that has the marked endurance necessary for a protective paint pigment. It is absolutely inert and is not affected by the actions of acids, alkalies or other deteriorating agents. It has the peculiar quality of "water repellancy" and as corrosion does not occur except in the presence of water or dampness, this is a strong point for its use as a pigment. Silica is used to give the natural flake graphite still further endurance. Experience has shown that a mechanical mixture of silica and graphite is in no way equal to the natural combination as found in Dixon's Silica-Graphite Paints.

Dixon's Silica-Graphite Paints are composed of boiled linseed oil for the vehicle and natural flake graphite for the pigment with the addition of small amounts of colors for tinting. They meet the above specifications in every respect.

Write for Color Card and Booklet No. 99-B

JOSEPH DIXON CRUCIBLE COMPANY
Jersey City New Jersey
Est. DIXON 1827

DIXON'S SILICA GRAPHITE PAINT
Adequate Protection at Minimum Ultimate Cost

through the Griscom-Russell heat exchanger and into the still. Both open and closed live steam are employed in distillation work. The hot oil, after being stripped of its gasoline content returns through the heat exchanger and through Griscom-Russell coolers, and into a small absorption oil storage tank, from which it is recirculated into the absorber. Gasoline vapors from the top of the still and dephlegmator pass into a Griscom-Russell condenser and to the run tank, mentioned above. The still is operated at 210 to 220 F., with adequate control devices for temperature regulation.

Gasoline arriving at the small run tank is held at a temperature of 105 F. Water separating from the gasoline at this point is displaced from the system through the utilization of a Fisher liquid level controller. The temperature of the gasoline in the run tank is held constant through the use of exhaust steam in a closed coil, which steam is supplied by the small duplex steam pumps operating the unit. In addition sufficient live steam is fed into the run tank under positive thermostatic control to maintain the desired temperature.

Vapors driven off of the gasoline in the run tank pass into the adjacent weathering tower, or stabilizer, and the wilder portions are removed while the stable gasoline is accumulated at the bottom.

The unit is practically automatic in its operation and does not require any additional labor. It has the advantage of compactness, simplicity, and relatively high capacity, and is not expensively constructed.

TREAT CONTINUOUSLY

The new continuous treating plant consists of four treating columns having a capacity of 250 barrels each. In this system pressure distillate is acid treated at the rate of 250 barrels per hour. The acid and oil are mixed in an outside orifice contracting device and passed into the first drum where the acid settles out. In the second drum the oil is washed with water; caustic for neutralization is mixed with the oil in a second contracting device, to settle in the third drum, and a final washing is given the oil in the fourth treating column. A fifth treating drum or settling tank is being added to the system to give longer settling time.

Finished gasoline derived from the operation of the tube still and subsequent fractionation, reboiling and steam sweetening in the bubble tower, is treated with caustic solution for the removal of any hydrogen sulphide present.

ENDURANCE

A characteristic of the Polar Bear and also of the products manufactured by The Garlock Packing Co., Palmyra, N.Y.

APPROPRIATELY clothed in white, the polar bear lives permanently on the ice packs often hundreds of miles from the nearest land. Having a quantity of protective fur on the soles of its feet as well as on its entire body, the great ice bear of the Arctic can endure the severest sub-zero temperatures that exist in the land of ice and snow.

Like the polar bear, Garlock Mechanical Packings have great powers of endurance under the most severe and trying conditions. These products have remarkably long life as they are scientifically manufactured from the best of crude materials by master craftsmen.

Standardize on Garlock and be relieved of troublesome packing problems. There is a Garlock Service Man in your vicinity who is ready to call at your plant and make recommendations to meet your individual requirements.

The J.P. Devine Manufacturing Company

announces a new plant for the broader service of the field

WE have long and persistently advocated equipment replacement on the basis of efficiency surveys—the determining of how much it actually costs to produce with old equipment and the comparing of that figure with the results which new-modern-equipment will produce.

Clients in all parts of the world have accepted and acted on these premises. In many instances they have found it sound business to continue operations with old equipment. A large percentage found otherwise—and new machinery, processes—and even entirely new plant structures designed and built by the J.P. Devine Manufacturing Company were the result.

Our own organization—under the pressure of increased business—recently reached the point where it became its own client. The findings were direct, concise and imperative. The old equipment would no longer do if the company was to continue its leadership in the service of the Process Industries.

We have broken ground for our new plant at Mt. Vernon, Illinois. It will be occupied and in full operation in the near future. Our Buffalo, New York, plant is being continued. The new plant, equipped throughout with the most modern machinery available, will increase our facilities many fold.

J. P. DEVINE MANUFACTURING COMPANY

Main Office: Buffalo, New York
New York Office: 51 East 42nd Street
Chicago Office: 122 South Michigan Avenue

Accident Statistics--Their Value And How to Use Them

By W. GRAHAM COLE

Lecturer on Accident Prevention, New York University. *Copyright, 1928, by the American Trade Press. All re-publication rights reserved*

EFFICIENCY in accident prevention, as in any other industrial enterprise, requires a knowledge of facts. The facts concerning the accident situation of a plant, gathered into statistical form, will help to prevent accidents by showing their principal causes, and will furnish a barometer by which the progress of an accident prevention campaign may be measured. Such statistics are easily prepared, and are valuable in a small as well as in a large plant.

Most of the information which is needed can be obtained, from the reports required by workmen's compensation laws or by insurance companies carrying compensation or liability insurance. Based upon this information, essential accident statistics can be prepared with little additional effort.

The primary function of accident statistics is to show the causes of accidents which have occurred so that they can be eliminated. If, for example, the statistics show, in a particular plant, that most accidents occur in material handling, a concerted effort can be made to discover just how such accidents can be avoided in the future. The apparent cause may not, however, be the real cause, and an attempt should be made to discover what, fundamentally, is responsible.

The following is an example of what might occur in almost any plant. A man was walking through the aisle of a shop carrying a bundle of tools in his arms. The light was poor, making it impossible for him to see ahead clearly. In the other end of the shop, some machinery had been uncrated, and the boards piled onto a hand truck which was too small to hold them. When the truck was pushed down the aisle, one of the boards with a nail in it, fell to the floor. The workman, stepped on it and received a slight injury. He neglected to go to the plant doctor that day or the next. The third day, he was unable to walk. The doctor went to him, and found that blood poisoning had set in, making it necessary to amputate the leg. What was the cause?

Not merely that a man stepped on a nail. If the accident had been reported promptly and the injury treated immediately it would have been trivial. If the plant had been properly lighted, the workman would have seen the nail, and would not have stepped on it. We can go still further. If a truck large enough to hold the wood had been used, none would have fallen off to cause the injury. And if every workman was careful to turn down nails—which should always be done—no injury could possibly have occurred, despite all the other contributing factors. Thus, the primary cause in this case was the last: workmen were not making it a practice to turn down nails, and it was this which, before the other things, should have been corrected.

The second important use of accident statistics is to learn the relative standing of departments. This will indicate the effectiveness of supervision in the different departments, and show, often, where additional mechanical guards or other means of accident prevention are needed. It will stimulate safety work, too, by creating a competitive spirit among the departments, each trying to achieve the best record.

A third purpose of accident statistics is to show the trend of accidents in the entire plant from week to week, from month to month, and year to year, and thus provide an index to the effectiveness of the safety campaign in the entire plant. If a safety campaign is being conducted, and there is no reduction in the frequency and severity of accidents, it is clear that something is not being done properly, or that the wrong methods are being used. If, on the other hand, the statistics show a steady decline in the number of accidents from month to month, it means that the particular safety methods in use are effective, and they should be continued. It is also valuable to know how the plant compares, in accident experience with other plants doing the same kind of work. This comparison will serve as another guide to the effectiveness of the campaign.

The gathering of accident information for state and insurance reports as well as for the company's statistics will be facilitated by providing foremen with blank forms to fill out when accidents occur. Since a description of the exact nature of the injury must come from the doctor, the foreman's report need not contain this information in detail. It should, however, be specific concerning the manner in which the accident happened. The foreman will be greatly aided by inclusion on the form of such questions as, "Did the accident happen on a machine? Was the machine guarded? Was it due to defect in equipment or defect in construction? Can the defect be corrected?"

It has proved very effective to include, also, after the question, "Can the defect be corrected?" the question "Will you see that it is corrected, and when?" For example, if the foreman, in filling out the form, says that John Jones was injured because there was no guard on a punch press, and answers "Yes" to the question "Can a guard be put on," there is nothing left for the foreman to do but to say that he will put on the guard. In this case, the report form is used to help prevent accidents as well as to give information. If the foreman is not present when an accident occurs, the cause should be determined immediately thereafter through a thorough investigation by the foreman and whoever else is responsible for safety in the plant.

It is essential to know, for statistical purposes, how long a man was absent from work because of injury. This information may be obtained from the records of

ADAMANT DISTRIBUTORS

Alabama, Birmingham,
C. B. Davis Engineering Co.
California, Los Angeles
Industrial Supply Co.
California, San Francisco,
W. E. Mushet Co.
Colorado, Denver,
H. W. Thompson
Connecticut, Hartford,
Factory Supply Co.
Connecticut, New Britain,
Rackliffe Bros. Co., Inc.
Connecticut, New Haven,
The Warner-Miller Co.
Georgia, Atlanta,
Atlanta Textile Supply Co.
Illinois, Chicago,
Wm. E. Dee Co.
Indiana, Fort Wayne,
Harry A. Neff
Indiana, Indianapolis,
Indianapolis Belting & Supply Co.
Iowa, Des Moines,
Walredh Supply Co.
Kansas, Pittsburg,
Marshall Supply Co.
Kentucky, Louisville,
E. D. Morton & Co., Inc.
Kentucky, Paducah,
Henry A. Petter Supply Co.
Louisiana, New Orleans,
Woodward, Wight & Co., Ltd.
Louisiana, Shreveport,
Woodward, Wight & Co., Ltd.
Maryland, Baltimore,
Codd Tank & Specialty Co.
Massachusetts, Boston,
Waldo Bros. & Bond Co.
Massachusetts, Springfield,
Oscar F. Carlson
Massachusetts, Worcester,
Waldo Bros. & Bond Co.
Michigan, Detroit,
H. D. Edwards & Co.
Minnesota, Duluth,
Duluth Builders Supply Co.
Minnesota, Minneapolis,
Northern Machinery & Supply Co.
Missouri, Kansas City,
Union Material Co.
Missouri, St. Louis,
Handlan-Buck Mfg. Co
Nebraska, Omaha,
American Machinery & Supply Co.
New Jersey, Atlantic City,
Oil Burner Service Co.
New York, Buffalo,
The Curtis Supply Co.
New York, Mohawk,
American Hard Wall Plaster Co.
New York, New York,
C. C. Phillips, 110 W. 34th St.
New York, Rochester,
American Clay & Cement Corp.
Wm. Summerhays & Son
New York, Rome,
American Hard Wall Plaster Co.
New York, Syracuse,
Paragon Plaster Co.
New York, Utica,
American Hard Wall Plaster Co.
North Carolina, Asheville,
Southern Steel & Cement Co.
North Carolina, Greensboro,
Odell Mill Supply Co.
Ohio, Cincinnati,
Wm. T. Johnston Co.
Ohio, Cleveland,
Cleveland Tool & Supply Co.
Ohio, Columbus,
Westwater Supply Co.
Ohio, Dayton,
Klinger-Dills Co.
Ohio, Toledo,
Hixon-Peterson Lumber Co.
Oklahoma, Tulsa,
Marshall Supply Co.
Oregon, Portland,
The Kline Specialty Co.
Pennsylvania, Bethlehem,
Morris Black
Pennsylvania, Erie,
O. C. Thayer & Son
Pennsylvania, Pittsburgh,
Pittsburgh Supply Co.
Pennsylvia, Reading,
Reading Foundry & Supply Co.
Rhode Island, Providence,
B. & H. Supply Co.
South Carolina, Columbia
Columbia Supply Co.
South Carolina, Spartanburg
Spartanburg Mill Supply Co.
Tennessee, Memphis,
Reed & Duecker
Tennessee, Nashville,
McCarthy-Jones & Allen Co., Inc.
Texas, Beaumont,
Norrell-Wilder Hardware Co.
Texas, Corpus Christi,
San Antonio Machine & Supply Co.
Texas, Dallas,
The Murray Co.
Texas, El Paso,
Geo. S. Thomson Co
Texas, Houston,
Norrell-Wilder Hardware Co.
Texas, San Antonio,
San Antonio Machine & Supply Co.
Texas, Waco,
San Antonio Machine & Supply Co.
Virginia, Norfolk,
Empire Machinery & Supply Corp.
Virginia, Richmond,
Southern Ry. Supply Co.
Washington, Seattle,
Cragin & Co.
Washington, Spokane,
Consolidated Supply Co.
West Virginia, Charleston,
So. Side Foundry & Machine Wks.
Wisconsin, Milwaukee,
W. H. Pipkorn Co.
Wisconsin, Superior,
The Speakes Company

Canadian Distributors

British Columbia, Vancouver,
B. C. Equipment Co., Ltd.
Manitoba, Winnipeg,
Walter Belyea & Co., Ltd.
Ontario, Hamilton,
Thomson-Gordon, Ltd.
Ontario, Port Arthur,
Wells & Emmerson
Ontario, Toronto,
J. H. Morrison
Quebec, Montreal,
Alex. Bremner, Ltd.

Foreign Distributors

France, Paris,
Compagnie Technique Des Petroles
New Zealand, Auckland,
Wilton Furnace & Coal Co., Ltd.

(Air photo by Bowman-Park Aero Co., Louisville.)

In tube still fire brick construction at Stoll Oil Refining Company, Louisville, Kentucky, ADAMANT Fire Brick Cement has given very satisfactory service.

Coatings of the proper mixture of ADAMANT-ADACHROME, applied frequently with The ADAMANT Gun, keep still settings continuously in good condition and prolong their life. ADAMANT comes in 100 lb., 250 lb. and 400 lb. containers. ADACHROME is shipped dry in 125 lb. bags. Write for particulars.

At Stoll Oil Refining Co. . . .

"Very Satisfactory Service"

from ADAMANT *Fire Brick Cement*

"VERY satisfactory service," is invariably the report from refineries using ADAMANT, the *original* high temperature fire brick cement, for building and repairing fire brick construction in stills and boiler settings.

Joints between brick, made with ADAMANT, air set and require no heat to bond. Yet they maintain their bond through the entire temperature range.

ADAMANT joints also protect the edges of the brick, preventing cracking and spalling. ADAMANT joints do not shrink nor open up in service, because ADAMANT is made almost entirely of pre-calcined materials and therefore has little shrinkage.

Because of the high strength and tenacity of ADAMANT joints, they prevent creeping or traveling of brick. In addition, ADAMANT is highly resistant to sulphur in oil fuel or other actions which cause fluxing, slagging or destruction of brick.

Write today for a copy of the new interesting booklet on ADAMANT Fire Brick Cement, The ADAMANT Gun and The Super-Refractory Mixtures of ADAMANT-ADACHROME *Fines* for more severe conditions.

BOTFIELD
REFRACTORIES CO.
Swanson and Clymer Streets,
Philadelphia, Pa.

For a Long Furnace Run, Use The ADAMANT *Gun*

ADAMANT
FIRE BRICK CEMENT

Whenever You Use a Fire Brick, Use ADAMANT, *the Original High Temperature Cement*

Mention Where You Saw the Advertisement

the timekeeper or bookkeeper. State boards and insurance companies require the doctor to prepare forms stating when the injured man will probably be able to return to work. When the man does return, the doctor is required to fill out another form.

Accident reports can be tablulated in an ordinary day book, being posted with the man's name, his work number, the date he was injured, the nature of the injury and the cause of the accident. These should be checked at the end of a stated periotd, and classified according to major causes. It is often convenient to indicate the major causes of accidents by code letters or numbers. A clerk can enter the letter or number in the book, and they can be classified easily in this way. When there are only a few accidents each month, it is sufficient to keep the reports together, and classify them directly at the end of each month. The number of accidents from each cause and the time lost from each cause should be tabulated, and the percnetage of the total which each represents.

For the purpose of comparing accidents in one department with those in another, and for comparisons between companies, it is not enough to know just the number of accidents and the total time lost. For example if one department employs 40 men, and another employs 500, it would not be accurate to say that the smaller department, with two accidents, had a better record than the larger department with three. It is necessary to reduce the figures to some common denominator. For comparison of one company with another, it is not satisfactorv even to figure accidents on the basis of the number occurring for each hundred or each thousand men, since the number of hours and even the number of days per week may differ. It is, therefore, desirable to figure accidents on the basis of the number of hours actual work, as indicated by the timekeeper's records. A "frequency rate," the number of accidents per million man-hours' work, is generally used in safety statistical work, and is recommended by the International Board of Accident Commissions.

Since the "frequency rate" does not take into account the time lost, there is another rate, called the "severity-rate," which is derived from the number of days lost per thousand man-hours' work. Both these rates have become fairly standardized. A constant rate of 6000 has been accepted as the equivalent number of days lost for a fatal accident, and a comparable allowance in days lost, based on compensation law provisions is made in the case of permanent disabilities.

Accident statistics are valueless if they are prepared and not used, as happens in many plants. Copies of accident records and an analysis of them should be sent to the general manager and the superintendent, and they should be presented at foremen's meetings and at workmen's committee meetings. They may also be posted on the bulletin board. A graphic presentation makes statistics more interesting and more easily understood by the workmen. For example, a total or a percentage can be shown by a straight line, the length of the line being in proportion to the figure. One line can represent each department or each month, and the varying lengths will permit comparisons to be made at a glance.

Heat Transfer in Ammonia Condensers

REFRIGERATION plays a vital part in the operation of all refineries engaged in the manufacture of lubricating oils, where it is used both in chilling wax-distillate to a low temperature for the subsequent removal of the separated wax by filter-presses; and in the separation of wax from cylinder stocks in the manufacture of low cold-test cylinder stocks and bright stocks either by the cold-settling or centrifugal methods. So, too, recent development of a process for treating cracked distillates at reduced temperatures would seem to indicate that refrigeration is going to play even a more important part than heretofore in the manufacture of finished products from crude petroleum.

In view of the above, the refinery superintendent and refining or designing engineer will find much practical data on heat transfer in ammonia condensers in a paper recently published[1] in which is given the results of an extensive study of this subject. The present discussion will summarize the findings of the authors (Kratz, Macintire and Gould) of that paper. The interested reader can obtain the complete report by asking the Illinois Engineering Experimental Station, Urbana, Illinois, for Bulletin No. 171.

Heretofore, the desire for safety has been the most influential factor in the design of ammonia condensers, where anhydrous ammonia has been the principal working medium. Consequently, constructions involving pipes and fittings have been accepted as a logical basis for design, the advantages therein being:

1. Safety.
2. Ease of erection.
3. Reasonable efficiency in the use of water.
4. Moderate in first cost.

With the various arrangements of pipe surface, the common atmospheric and the bleeder types of condensers were developed. Further development resulted in the submerged, the shell-and-coil, the double-pipe, the

[1]Paper on this subject by Alonzo P. Kratz, Horace J. Macintire and Richard E. Gould in the *University of Illinois Bulletin*, Vol. 25 No. 15, Dec. 13, 1927, and published as Bulletin No. 171 of the Illinois Engineering Experimental Station, of which this article is a condensed summary.

NOT A SINGLE JOHNS-MANVILLE PROTECTED TANK TOOK FIRE!

An order for 62 additional Johns-Manville Vapor-tight Insulated Tank Tops was placed by a large oil company after the fire below at their Tank Farm near Midland, Texas, May 17, 1928

Insurance Rates are materially lowered where Wooden Deck Tanks are Protected by Johns-Manville

VAPOR-TIGHT TANK TOPS

AND GROUNDED CONDUCTOR NETWORK

THERE were 11 tank fires in West Texas this spring—3 in Oklahoma. All were old style wooden roofs. Adjoining these fires were tanks protected with Johns-Manville Vapor-tight Tank Tops. Though swept by the flames, in not a single instance were any of these tanks ignited.

Because of the practical elimination of fire hazard the Johns-Manville Tank Top is particularly valuable in West Texas fields where sulphur in the oil causes corrosion and makes metal roofs impracticable. But their ability to save money by controlling evaporation losses makes Johns-Manville Vapor-tight Tank Tops a sound investment on all types of decks, both metal and wood. The high insulating value of the Johns-Manville Top equalizes temperatures in the tank and reduces breathing losses; by making decks and eaves vapor-tight, wind drift is eliminated. Proven savings of as high as $5,000 a year have been shown on standard 55,000 barrel tanks—savings that have paid for the Top in 6 to 8 months.

Of equal importance is the protection afforded against lightning by our special grounded conductor network. In over a thousand installations of the Johns-Manville Tank Top made within the past 5 years, not one fire has resulted from secondary lightning discharge. More than 70,000,000 barrels' storage capacity are now protected by Johns-Manville Vapor-tight Tops. We will gladly send you full information of this remarkable money-saving equipment.

JOHNS MANVILLE CORPORATION

Johns-Manville

VAPORTIGHT INSULATED TANK TOPS

JOHNS-MANVILLE CORPORATION
New York Chicago Cleveland
San Francisco Toronto
Branches in all large cities

Please send me a copy of your booklet, "Controlling Evaporation."

Name.....

Company.....

Address.....

01-54-2

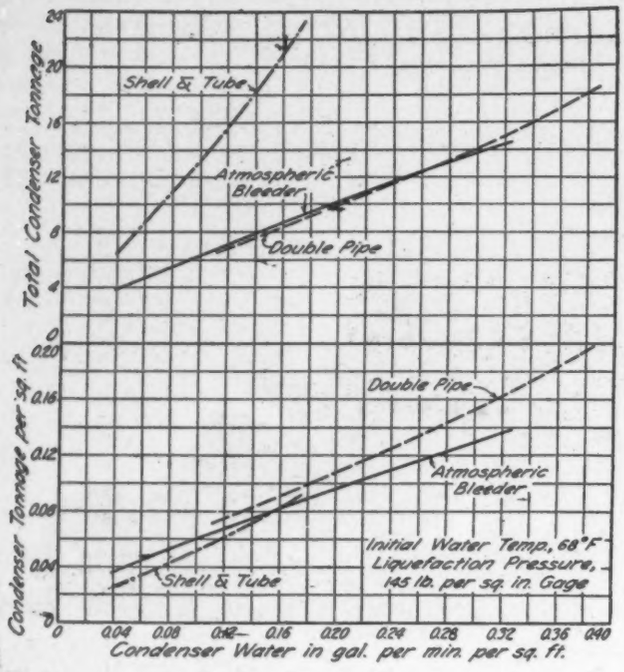


Figure 1—Comparison of the performance of three types of ammonia condensers

flooded condenser of various designs and, finally, in the horizontal and vertical shell-and-tube condensers. During this period, the design of condensers also developed concurrently with a consideration of counterflow versus parallel flow of the water and the ammonia, and with an endeavor for proper and efficient disposal of the superheat contained in the ammonia gas at the inlet to the condenser. In all of the designs, however, safety was a primary requisite; efficiency and economy of operation, secondary. In order to correlate and to give proper weight to the various factors entering into the design and operation of a number of outstanding types of ammonia condensers, Kratz, Macintire and Gould undertook a systematic and rather extensive program of research—the results of which are herein summarized.

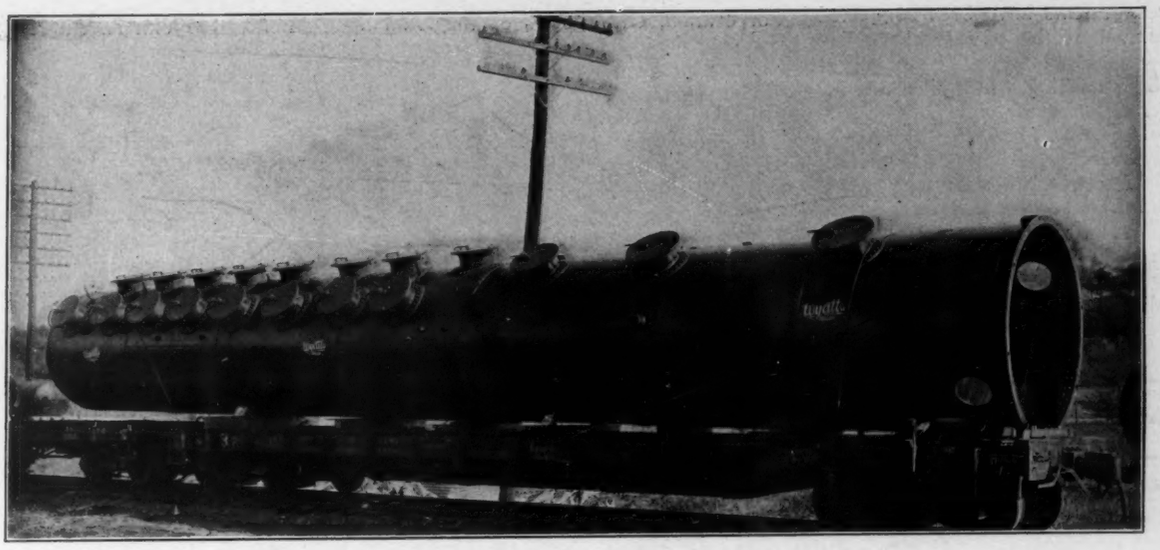
Figure 1 shows, in chart form, a comparison of the performance of the shell-and-tube, atmospheric bleeder and double-pipe types of ammonia condensers. In this chart, both the unit condenser tonnage and the total condenser tonnage have been plotted against the unit water rate for an initial water temperature of 68° F. It is to be noted that, apparently, one square foot of surface is more effective in the double-pipe condenser than it is in the atmospheric-bleeder condenser; and that, approximately, the same increase in effectiveness with increasing water rates was obtained for both of these condensers. The rate of increase was much greater, however, in the case of the shell-and-tube condenser and, while the surface is less effective at low water rates than the surface in the other two condensers, it becomes more effective than either of the other two at water rates above, approximately, 0.20 gallon per square foot per minute. This effectiveness undoubtedly is influenced by the thickness of the layer of condensed liquid adhering to the surface, and by the ability of the surfaces to clear themselves of the layer at higher rates of condensation.

When the total tonnage developed is taken into consideration, it is apparent that the shell-and-tube condenser has the greatest capacity. The total area of the bleeder condenser exposed to saturated ammonia was 105.3 square feet; for the double-pipe condenser, 92 square feet. This difference slightly more than offsets the difference in effectiveness per square foot, in view of the fact that the capacity of these condensers was practically the same. However, if the same external dimensions be retained, it is possible to obtain more area with the bleeder condenser than with the double-pipe, since, in the latter, the condensing surface is that of the inside pipes. The total surface exposed to saturated ammonia in the shell-and-tube condenser was 251 square feet. It is possible to obtain a greater amount of surface for the same floor space with this condenser than with the others. Apparently, too, the surface could have been much reduced, while at the same time retaining a rating comparable with that for the bleeder and double-pipe condensers.

In the original paper, curves are given as to the results of a study of the coefficient of heat transfer for the three types of condensers. A water rate of 1.41 pounds per minute per square foot of surface corresponds to a total water rate of 148 pounds per minute for the atmospheric bleeder; 130 pounds per minute, for the double-pipe; and 352 pounds per minute for the shell-and-tube condenser. The greater values of K indicate that at high water rates one square foot of the surface in the shell-and-tube condenser is more effective than one square foot in the other two condensers.

The amount of superheat in the gas entering the atmospheric-bleeder and the double-pipe condensers does not affect materially the amount of surface exposed to the action of saturated ammonia vapor. For still-air conditions, the loss in water due to splash from the atmospheric-bleeder condenser ranges from 0.5 per cent. to 8.5 per cent. of the total water fed to the condenser. This amount would be increased, if splash strips between the pipes were omitted. The water adheres to the tubes in the shell-and-tube condenser in a fairly-uniform layer, and no appreciable amount of spray is formed. The condenser tonnage is a function of the water rate and the initial temperature of the cooling water. High initial temperatures require high water rates to develop the same condenser tonnages. The thickness of the layer of liquid ammonia adhering to the condensing surfaces materially affects the rate of heat transfer per unit surface. The effectiveness of the surface increases more rapidly with increasing water rates in the shell-and-tube condenser than it does in the bleeder and double-pipe condensers. At water rates above 0.19 gallons per minute per square foot, with an initial water temperature of 68° F., the effectiveness of the surface of the shell-and-tube condenser becomes greater than that for the other condensers. In the atmospheric bleeder and the double-pipe condensers, from 37.0 per cent. to 67.5 per cent. of the total liquefication may occur in the pair of pipes exposed to the coldest water. No appreciable amount of sub-cooling of the liquid occurs under conditions comparable with those in these tests.

In the opinion of Kratz, Macintire and Gould, an advantageous design for a condenser is one in which the condensate is removed completely and immediately from the condensing surface.



A Product of the Wyatt Shops—Bubble and Vaporizer Tower 63′ in length—8′ in diameter

Bubble Towers, Vaporizers and Absorbers are turned out in the Wyatt Shops regularly and satisfactorily for an increasingly large number of Oil Companies and Refineries in the Southwest.

WYATT METAL & BOILER WORKS
DALLAS, TEXAS

Wyatt's **WYATT** METAL & BOILER WORKS

Mention Where You Saw the Advertisement

Gasoline Plant Operators Meet at Ranger

All arrangements have been completed for the annual meeting of natural gasoline plant operators at Ranger, Texas, February 26. This meeting, which is part of the activity of the Natural Gasoline Association of America, will be held in the American Legion hall. Sessions will be held, morning, afternoon and evening.

At noon there will be a barbecue lunch, when those attending the meeting will be guests of the association.

The evening session will be followed by a musical program. The families of plant operators are expected to attend this session and to remain for the entertainment.

The program was arranged by Dr. E. R. Lederer, vice president of the Texas Pacific Coal & Oil Company and also vice president of the association, together with Fred Yonkers of the Chestnut & Smith Corporation, Otto Peters of the Hanlon Gasoline Company and E. Buddrus of the Phillips Petroleum Company.

The program follows:

Morning Session, 10 to 12 M.—

"Operation and Care of Electrical Equipment," by Mr. Clifford Clegg, manager, Texas Electric Service Corporation.

"Absorption Oils," by Mr. P. Beo, director of research, Arab Gasoline Company. Discussion to follow each paper.

Recess for barbecue lunch, furnished by the Natural Gasoline Association of America.

Afternoon Session, 2 to 4:30 P.M.—

"Distillation Apparatus in the Use of Natural Gasoline Manufacturing," by J. E. Kobernick, vice president and general manager, Engineering Research & Equipment Company.

"Belts," by John A. Guffey, Industrial Belting Company.

"Repressuring and Its Relation to Natural Gasoline Production," by Ed. Guidinger, Phillips Petroleum Company.

"Operation and Maintenance of New Ford Equipment," by E. Bonham, Ford agent, Breckenridge, Texas. Discussion to follow each paper.

Evening Session, 7 to 8 P.M.—

"Accidents in Natural Gasoline Plants," by C. L. Hightower, safety director, Texas Pacific Coal & Oil Company.

"Benefits of Safety to the Operator and His Family," by Don Wallace, safety director, Mid-Continent Oil & Gas Association.

Acid Handling

WITH an installation cost lower than other types of acid handling equipment, a Duriron pump will handle treating plant acid with less power, time and labor than compressed air. A Duriron pump also eliminates the danger of tank rupture by excessive air pressure.

Maintenance expense is extremely low, as all parts of this sterling unit coming in contact with the acid or sludge are of Duriron, and therefore extremely resistant to the dual attack of corrosion and erosion encountered in refinery service.

These pumps are produced in sizes to handle any requirements. Complete information mailed on request.

MOTOR DRIVEN DURIRON CENTRIFUGAL PUMP NO. 40

Duriron is produced only by

The DURIRON COMPANY DAYTON·OHIO

N. P. A. Fire Committee Appointed

E. M. Lyons, president of the National Petroleum Association, has recently announced the appointment of a committee of six men to study fire insurance as pertaining to oil refineries. Particular study will be given to Schedule No. 20, a rating schedule adopted by the Department of Welfare and Insurance after this schedule had been arranged by the Underwriters Association of the middle department for determining insurance rates on a definite basis.

Schedule No. 20 was adopted in January, 1927, and since that date, it has gradually been put into effect in rating refineries. All oil refineries in Pennsylvania except those located in Alleghany, Philadelphia and Delaware Counties are rated for fire insurance by the Underwriters Association of the middle department.

Members of the newly appointed committee in Pennsylvania are as follows: L. C. Jamieson, chairman, Viking Oil Corporation, Clarendon; L. J. Fulton, Pennzoil Company, Oil City; Wayne K. Glenn, Pennsylvania Refining Company, Karns City; James H. Herbert, Conewango Refining Company, Warren; G. B. Hunter, Emlenton Refining Company, Emlenton, and W. A. Powell, Tiona Refining Company, Philadelphia.

With the organization of the Shell Development Company, S. C. Carney of the Roxana Petroleum Corporation has been transferred to Oakland, California, to take charge of this new Shell unit. Mr. Carney was in charge of the natural gasoline department of the Roxana Petroleum Corporation for a number of years. He has been conducting research work in the Mid-Continent for the past two years.

The Shell Development Company will devote all its efforts to research work in connection with both refining and natural gasoline plant manufacture. It will be independent of other Shell units in the United States.

In his work in the Mid-Continent Mr. Carney had taken a leading part in the affairs of the Natural Gasoline Association of America. He was serving his second term as vice president at the time of his leaving Tulsa.

REED AIR IS *CLEAN* AIR

TO INSURE CLEAN AIR, FREE FROM ABUSIVE DUST, THE HELIUM CO., DEXTER, KAN., HAS INSTALLED FIVE REED AIR FILTERS

Manufacturing and producing costs are decidedly lower when Reed Air Filters are installed to supply clean, filtered air to engines and compressors. Hundreds of installations of Reed Air Filters, and years of service prove this beyond question.

Reed Air Filters remove the cause of a big percentage of lost operating efficiency, shut-downs for repairs, and high maintenance, through their scientifically designed principles of air filtration, which insure (1) Highest cleaning efficiency, (2) Greatest dust capacity, (3) Simple, easy maintenance.

Write for illustrated Reed Air Filter Catalog, or ask any Smith Separator Company representative for details.

Reed Air

TRADE MARK

SMITH SEPARATOR COMPANY,
Box 2003, Tulsa, Oklahoma.

Please send Reed Air Filter Bulletin No. 120-1.

Name .....

Address .....

REED AIR FILTER COMPANY, Inc.
LOUISVILLE, KY.

Distributed by

SMITH SEPARATOR COMPANY
Tulsa *Okla.*

LOS ANGELES SHREVEPORT HOUSTON FORT WORTH

Mention Where You Saw the Advertisement

Texas Company Plant at Houston Enlarging

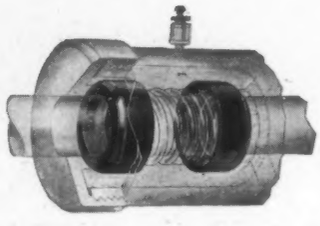
The Texas Company, which last year bought the properties of the Galena Signal Oil Company of Texas, plans to remodel and enlarge the Galena refinery on the Houston Ship Channel; and now has engineers at work preparing plans for the proposed replacements and enlargements. When these plans are submitted and approved, construction will begin immediately; and the changes are expected to be completed within six months.

The above information was verified by R. C. Holmes, president of The Texas Company, but no statement was given out as to the exact changes that would be made, or the proposed capacity of the plant.

Situated on the Houston Ship Channel the Galena Signal refinery is accessible to the largest sea-going tankers; and it constitutes the second refinery of The Texas Company on tidewater in Texas, the other being at Port Arthur—one of the largest refineries in the world.

The refinery will obtain its crude supply through pipe line connecting with a tank farm, also acquired from Galena Signal Oil Company of Texas, situated four miles from the refinery. In addition, The Texas Company will, without laying additional pipe of consequence, have pipe line connection with the line leading out of the West Columbia field, and with the new West Texas to Port Arthur line, now under construction. The line out of West Texas will lead through Humble, and from there a line already connects up with the Galena tank farm, which in turn has pipe connection with the Galena refinery.

This Ring Will Banish Your Stuffing Box Problems



So simple—so efficient—so necessary is the Cooke Seal Ring that in a short space of time nearly a quarter million have been sold with universal satisfaction.

This ring maintains a leakless pressure or vacuum on a wide range of fluids, gases and air. It reduces friction 90%. It reduces motor load and does away with wear on the shaft, scoring and hot boxes.

This amazingly simple mechanical device absolutely prevents leaks around a rotating shaft because it is bound leak-proof and frictionally tight *on* the shaft and rotates *with it* instead of pressing against it. Thus a ground joint is formed against the gland having only 3/16" of bearing surface.

The Cooke Seal Ring is simple in construction. Nothing can go wrong and there are a thousand places in industry where it can, or is now being successfully used.

MACHINERY MAKERS:
Ask us to show you how Cooke Seal Rings can improve the efficiency of your product.

MACHINERY USERS:
Your local supply house will sell you Cooke Seal Rings to install in your present stuffing boxes. Or write us direct.

COOKE
Seal Ring

DEPT. K
44 NORTH GREEN STREET, CHICAGO, ILLINOIS

MEET US and see the Cooke Seal Ring in actual operation on a Domestic Ammonia Refrigerating Machine at the Mid-winter Engineering and Power Exposition, February, 12-16, at the Coliseum, *Exhibit No. 193.*

N. P. A. Session Set April 25 and 26

The semi-annual meeting of the National Petroleum Association will be held April 25 and 26 at Cambridge Springs, Massachusetts. Sessions will be in the Riverside Hotel. The spring meeting of this organization has been held there for the past several years.

The program committee, consisting of O. P. Keeney, H. H. Greene and P. S. Tarbox, is now working on the program.

The official notice of the meeting reads in part:

"These semi-annual meetings at Cambridge Springs are strictly business sessions, with a bit of relaxation at the fellowship supper. They have developed some very valuable discussions and are always well attended. It is suggested that you write to the Hotel Riverside promptly for reservations."

Kent-Middleton Refinery Ownership Change

Garland C. Kent, president of the Kent-Middleton Refining Company, which is operating refineries at Angus and Minerva, Texas, with producing properties in Navarro and Milam Counties, has disposed of his interest in the properties to C. A. Middleton and associates. Headquarters are maintained at Corsicana. Kent made his entrance into the oil industry during the height of the drilling boom in the Corsicana-Powell field through oil having been deevloped on one of his farms lying in the heart of the flush area, and later acquired the two refining plants.

Charles B. Buerger Advanced by Gulf

Charles B. Buerger has been elected vice-president of the Gulf Refining Company, succeeding George H. Taber, who resigned recently. Mr. Buerger was formerly general manager of refineries.

Other changes in the personnel of the company, announced by George S. Davison, the president, are:

John W. Tryon, Port Arthur, becomes general manager of refineries; George L. Prichard, assistant general manager; William A. Slater, Port Arthur, general superintendent of the plants there and at Fort Worth; Herbert Henderson, Pittsburgh, manager of construction; John G. Glasgow, Port Arthur, chief engineer; Harry J. Kelly, Port Arthur, assistant chief engineer; Luther R. Jones, manager of the Philadelphia plant; James V. Baney, superintendent of the Philadelphia plant; Harris V. Sanderson, manager of the Bayonne refinery; Herschel G. Smith, Port Arthur, manager of refinery technology; O. G. Wilson, Jr., Port Arthur, chief chemist.

Natural Gasoline Meeting In Tulsa, May 20

Dates for the eighth annual meeting of the Natural Gasoline Association of America have been set for May 20, 21 and 22. The sessions will be in Tulsa.

Directors of the organization met in Tulsa and selected the dates and a program committee was named. E. L. Peck of the Empire Gasoline Company, Bartlesville; F. E. Rice of the Phillips Petroleum Company, Bartlesville, and Emby Kaye of the Skelly Oil Company, Tulsa, compose the program committee. This committee will select its own chairman.

Entertainment for the convention again will be provided by the Natural Gasoline Supply Men's Association of which J. H. Satterwhite, general manager of Westcott & Greis, Inc., is president. This organization was formed last year.

Ray E. Miller has been elected secretary of the Natural Gasoline Association of America.

Mr. Miller is best known to the petroleum industry for his work in first aid and safety work. When the Safety Section of the Mid-Continent Oil & Gas Association was enlarged in 1925, Mr. Miller was placed in charge of its activities and remained there two years. Later he returned to the Marland companies at Ponca City, from which he had been on leave in order to direct the safety program for the organization.

His selection as secretary of the Natural Gasoline Association of America came with the leaving of A. V. Bourque, who joined the Western Petroleum Refiners Association, December 15, 1928, as assistant to Howard Bennette, the managing director.

James H. Herbert of Warren, Pennsylvania, was elected president of the Fire and Safety Marshals division of the National Petroleum Association at the fourth annual meeting, held in Pittsburgh, January 17. Routine matters and reports on activities of the organization for the previous year made up most of the activity of the session.

Other officials are Sherman Brown, Mutual Refining Company, secretary and treasurer; and Frank G. Benedict, Sinclair Refining Company, vice-president.

H. N. Blakeslee of the National Safety Council spoke on special hazards in handling refinery fires.

Humble Oil & Refining Company has under construction an absorption type gasoline plant in the Boggy Creek field, Anderson-Cherokee Counties, East Texas, to strip gas which has been found in large quantities in that recently revived field. The plant will have a capacity of handling approximately 5,000,000 cubic feet of gas daily. While at this time the gas is being produced under high pressure and is unusually lean, the gasoline recovery normally is found to be profitable in the Boggy Creek production zone.

Humble Pipe Line Company is now constructing an eight-inch oil line from Boggy Creek to tap its main line at Groesbeck, Texas.

Here's a Saving That Means Money for You!

Texas Fire Brick Save Freight Costs and Valuable Time

If you're in the Southwest, use Texas Fire Brick for your refractory needs and save the cost of long freight hauls and the loss of valuable time.

Texas Fire Brick are now used throughout the Southwest by many refiners who once thought more costly fire brick necessary.

Write for facts concerning the Refractory Efficiency and lower local freight rates of Texas Fire Brick.

Address any member of the

Texas Fire Brick Mfrs. Assn.

Promoting Texas Fire Brick Economies

Address Inquiries to Any Member Listed Below

Texas Clay Products Co., Malakoff, Texas

Elgin Butler Brick Co., Austin, Texas

Acme Brick Company, Fort Worth, Texas

Athens Brick & Tile Co., Athens, Texas

TEXAS FIRE BRICK

COLOR
YOUR HIGH COMPRESSION GASOLINE

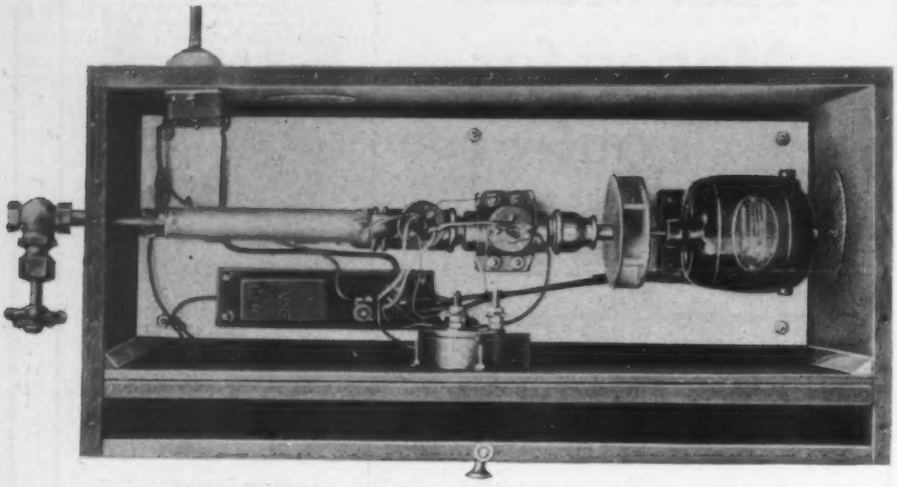
A DISTINCTIVE COLOR

Write us for samples of colors you wish to try

INTERSTATE COLOR CO., Inc.

41 PARK ROW NEW YORK

NEW EQUIPMENT, CATALOGS, BULLETINS, BOOKS



F-M Continuous Flammable Vapor Indicator with cover removed

Continuous Flammable Vapor Indicator

MINE SAFETY APPLIANCES CO.

The Mine Safety Appliances Company Pittsburgh, Pennsylvania, is featuring a new product, the F. M. Continuous Flammable Vapor Indicator. This is an instrument designed to continuously indicate the degree of inflammability, or proximity to explosive conditions, of combustible gases or vapors liberated in processes such as lacquering, painting, japanning, etc., where proper ventilation control is essential.

The F. M. Continuous Flammable Vapor Indicator may be used to advantage in connection with the recovery of solvents such as benzol, gasoline, acetone, lacquer thinners, alcohol, etc., and otherwise by the petroleum industry in confined spaces where there is danger of explosions from liberated vapors and gases.

In processes such as lacquering, japanning, and painting, the thinner used, when evaporated, may form explosive mixtures with air. Thinner vapors in the absence of proper ventilation may accumulate in drying ovens in dangerous concentrations resulting in violent explosions and loss of life and property. The only way to prevent these dangerous accumulations is to provide sufficient ventilation to keep the vapors or gases so lean that they will not explode; that is, below the lower explosive limit. Too much ventilation, however, is uneconomical and costly; hence the need of the F. M. Continuous Flammable Vapor Indicator for proper ventillation control.

Further information may be obtained from the Mine Safety Appliance Company.

Torridaire Hot Pad

Torridaire Hot Pad

The list of first aid equipment aboard the Eleanor Bolling, last of Commander Richard Byrd's expedition ships to leave New York, included one gross of Torridaire Hot Pads, a new heating pad manufactured by the Hallum Corporation and marketed by the Mine Safety Appliances Company of Pittsburgh, Pennsylvania.

Torridaire Hot Pad, illustrated here, is good for intermittent use to a minimum period of 80 hours and consists of a canvas bag containing a heating chemical and a rubber pouch in which the bag is inserted during use. The canvas bag is removed from the pouch, clip unfastened, two tablespoons of water are poured into the bag, which is shook for two minutes after the clips are fastened. Heating then starts and reaches the required temperature.

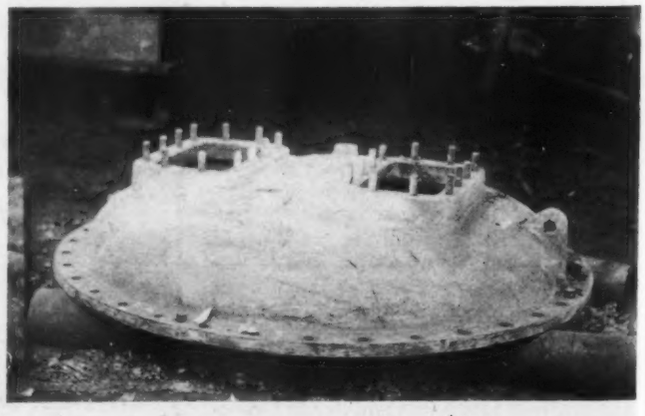
The pad is cooled by simply removing the bag from the rubber pouch. A new recharge of heating chemical is obtained when the original is exhausted.

An Interesting Bronze-Welding Application

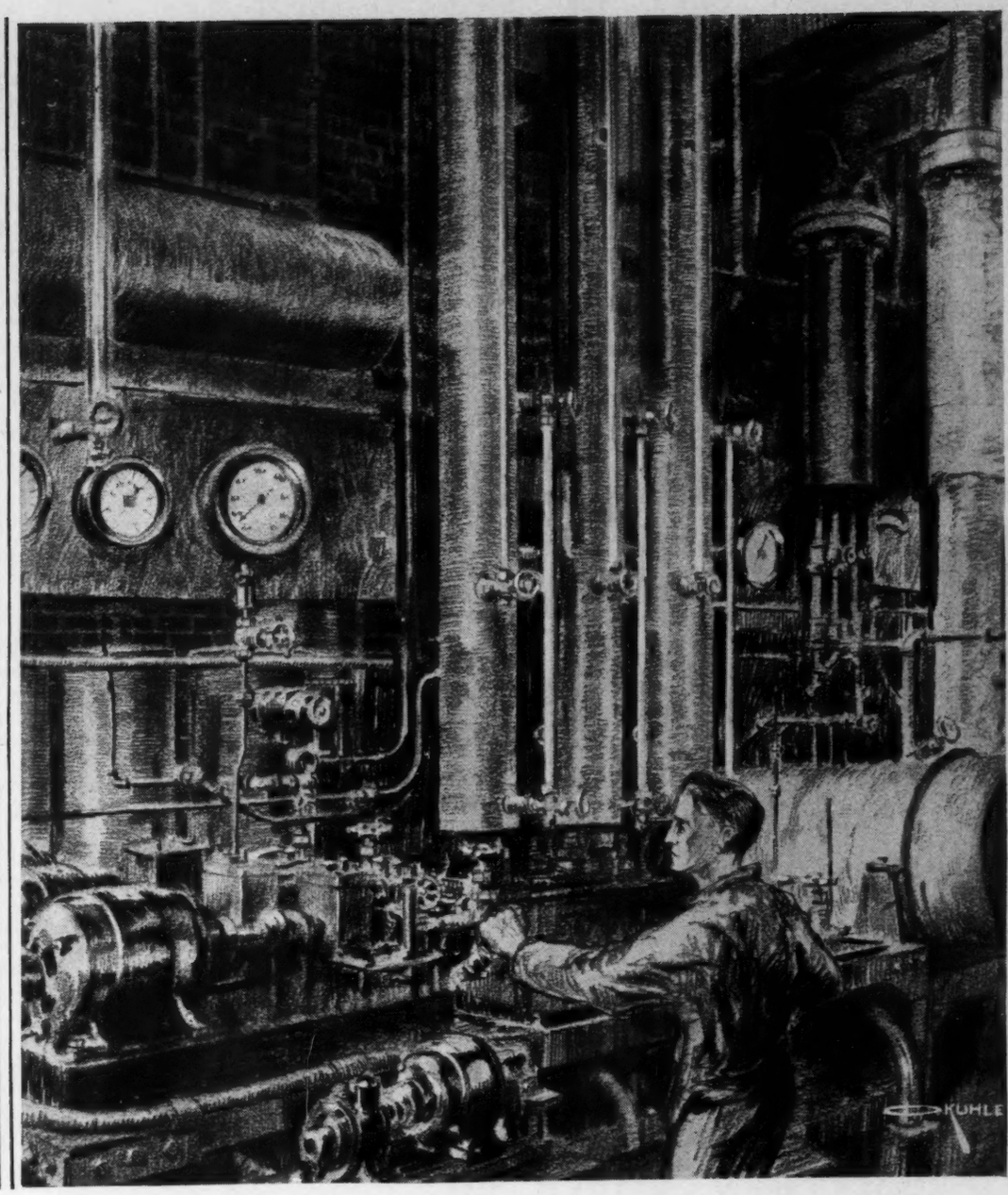
An interesting application of the oxy-acetylene process which was recently completed at the plant of a starch refining company convinced the superintendent of that establishment of the value of a welder and oxy-acetylene welding equipment.

The head of a condenser used in the refining process suffered an 18-inch break and it looked very much as if a serious loss would result. This condenser head was an intricate casting and would have been very costly to replace. The plant welder was called in and after looking over the piece and examining the nature of the break, decided that it would be best to preheat and bronze-weld.

Under ordinary conditions preheating operations are not necessary in bronze welding. Owing to the size and design of this job however, the extra precaution was taken. Consequently a furnace of loose fire-brick was built up. The condenser head was placed in the center of this temporary preheater, the base of the piece resting on two six-inch pipes. The next steps were to clean the crack thoroughly with a stiff wire brush and prepare and light a charcoal fire under the casting. An asbestos paper covering was placed over the job and the entire casting was allowed to come to an even temperature. Bronze welding was then begun. A standard high grade bronze rod was



Condenser Head Bronze Welded



LABORATORY RUNS ON ALL KINDS OF OIL ARE A BASIC PART OF KELLOGG SERVICE

At the Kellogg laboratory there is a complete miniature refinery, through which may be run 95% of all crudes. The characteristics of an oil are determined before Kellogg oil technologists design the equipment to be used in refining it. These laboratory runs are a basic part of Kellogg service, and are a large factor in the notable efficiency of Kellogg refinery equipment.

The M. W. KELLOGG COMPANY

225 Broadway, New York

HOUSTON, TEXAS, 1514 PETROLEUM BLDG. SAN FRANCISCO, CAL., 444 MARKET STREET

LOS ANGELES, CAL., 742 WESTERN PACIFIC BLDG.

Mention Where You Saw the Advertisement

chosen and a good quality of flux used to float off impurities.

After the weld had been completed the casting was allowed to remain in the furnace in a dying fire so that cooling would be gradual and uniform. The repair was a complete success and a lasting testimonial to the value of the process.

Frank H. Sprague has recently resigned as sales manager of the Skidmore Corporation and is now associated with George B. Burke, vice-president, Sarco Company, Inc., of Chicago. Mr. Sprague will act as sales manager of the newly created Western heating division, headquarters in the Engineering Building, New York City.

The Milliken Valve Corporation, 18 East 48th Street, New York, issued its Bulletin No. 1, in December, describing the Milliken Packless Pressure Lubricated Valves. This bulletin will be mailed upon request from the company headquarters.

In the operation of this valve a minute film of lubricant under pressure is forced between the bearing surfaces of the plug and the body without moving the plug from its seat in the body. This is designed to insure complete lubrication of all moving parts and enables the plug to be properly rotated. It prevents wear of any part and the entrance of foreign matter between the bearing surfaces.

Water pressure tests of 350 pounds (100 per cent. in excess of their rated pressure) are given the valves before shipment. Valves for gasoline service are tested with gasoline to 175 pounds pressure, and other valves, which cannot be given the water or gasoline test, owing to their lubricant, are tested with air pressure to 100 pounds.

The Marley spray cooling towers manufactured by The Marley Company, 1737 Walnut Street, Kansas City, Missouri, are fully described with illustrations in a new catalog recently published.

Twenty pages are devoted in this catalog to detailed description of the spray cooling towers, cooling cones, spray nozzles and the various types of Marley towers, each description being illustrated with photographs or drawings.

Marley Company representatives are listed, showing 16 concerns whose distribution centers are putting the Marley products conveniently in the consumer's territory.

A copy of this catalog will be mailed upon request.

Announcement has just been made by Heat Transfer Products, Inc., designers and builders of an extensive line of heat transfer apparatus, that it has become affiliated with the American Locomotive Company.

All manufacturing will be done in the plants of the American Locomotive Company, located in several parts of the United States and in Canada.

George T. Jacocks remains as manager of Heat Transfer Products, Inc. The company name as well as most of the key men will be retained.

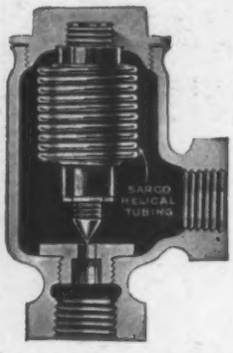
Utilizing its huge manufacturing facilities, Heat Transfer Products, Inc., is now producing equipment for the gas, petroleum, textile, power plant, heating and ventilating, refrigeration, laundry, paper mills, chemical plants and other industries requiring any type of heat transfer apparatus.

The offices of the company are located at 30 Church Street, New York.

The Griscom-Russell Company office at Boston, Massachusetts, has recently been located in the Chamber of Commerce Building, 80 Federal Street. The company, well established as manufacturers of refinery equipment, turn out a wide variety of material for this branch of the oil industry, as follows: G-R Bentube and Reilly Evaporators, Reilly water heaters, air coolers, the Multiwhirl cooler for maintaining constant temperature of lubricating oil, transformer oil and Diesel engine jacket water, Bleeder heaters, condensers, heat exchangers, and coolers for oil refineries and process work in industrial plants and other heat transfer apparatus.

The Campbell Engineering Company, manufacturers of Campbell Controllers for regulating steam to oil stills in refineries and manufacturers of the Tar Baby Oil Burner, have moved their offices from Short Hills, New Jersey, to the Industrial Office Building, Newark, New Jersey.

FREE trial for 30 days
--- by then



SARCO STEAM TRAP

earns its cost

We want you to test this trap at the most troublesome point in your plant at our expense, to prove to you that the Sarco will do all any other trap will do, even though it costs one-third the price of bucket and float traps.

Our faith in what the Sarco will do permits us to accept your order and let you try it entirely at our risk.

You can be the judge. And if the Sarco doesn't make good, then return it and the trial won't cost you a cent.

Sarco Steam Traps screw into the pipe line, so platforms and pits are unnecessary. They are self-adjusting from 0 to 100 lbs. Condensate is drained as soon as it forms.

Surely it's well worth your while to find out, under the protection of our free-trial offer, whether the Sarco will save you time and money. You can't lose on this straightforward offer. So write to-day for a Sarco on free trial. Also ask for Booklet S-230.

SARCO CO., Inc.
183 Madison Avenue, New York

Boston, Buffalo, Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh, St. Louis

Peacock Bros., Ltd., Montreal
Walker, Crosweller & Co., London, S. E. 1

ABSTRACTS OF TECHNICAL LITERATURE

Of Particular Interest to the Plant Operator

By H. L. KAUFFMAN

Separation of Crude-Oil Emulsions with Chemical Means. Kuczynski (Petroleum, March 20, 1928, p. 398; Libr. Bull., U. O. P. Co., Vol. 3, No. 14, pp. 139-40.) Of the chemical agencies for breaking petroleum emulsions, those which are soluble in the crude oil are typified by phenol and naphthenic acids. These are successful in the oils of the Boryslaw-Tustanowice field. Phenol is partially soluble in both phases of the emulsion, raises the mutual solubility of the crude oil and the water, lowers the boundary surface tension, collects on the boundaries of both phases, and, finally, has the power of dissolving the asphaltic substances which act as protective colloid in the natural emulsions.

The insoluble agents used in breaking oil emulsions do so by means of the electrical charge upon the water drops. Sherrick reported that the water in Texas oil emulsions was negatively charged; van Dood's finding was the same for California oil. Kuczynski tested seven samples of crude oil emulsions by cataphoresis using both microscopic and ultramicroscopic and ultramicroscopic methods; in every cause he found the water to be positively charged. When a synthetic emulsion was made up using water containing the salts sodium, calcium, thallium, and iron chloride, sodium sulfate, and potassium ferro and ferricyanide with unrefined but transparent heavy spindle oil, the charge of the water drops was again positive. When acidified water was used the water drops migrated to the cathode; in the emulsions containing O.1 N and 1.0 N sodium hydroxide the water moved to the anode when the oil mentioned above was used; but, with a highly refined transformer oil, movement on the whole was toward the cathode. Water and aqueous solutions are always, as having the higher dielectric constant, positively charged toward pure hydrocarbons. This is not true of oils containing impurities, which latter form protective films.

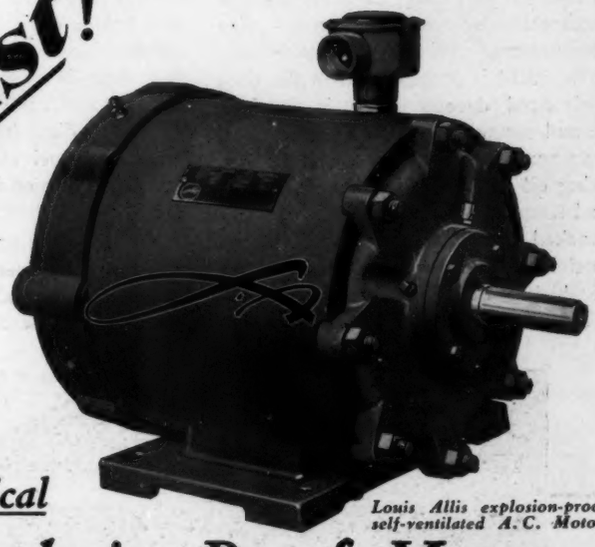
It was found that the water from the Boryslaw-Tustanowice emulsions had a Ph value of 6.2, 6.1, 6.28; the water from the Texas and California emulsions reacted alkaline. This may explain the finding of opposite charges upon the water droplets. Tests indicated that emulsions could be broken or partly destroyed by combining corresponding quantities of acid and alkaline emulsions if they were not too far from the electric neutral point.

Acid tars from refining with concentrated sulfuric acid, freed of excess acid, are of assistance in breaking emulsions. Cataphoresis experiments showed that the tars become charged negatively toward the oil and assist in precipitating the positively charged water drops. In a natural, water-free clay emulsion, the clay particles were negatively charged toward the oil; but a watery clay emulsion was subjected to cataphoresis with the surprising result that the water moved to the cathode and the clay and sand to the anode. The oil-saturated clay forms a protective film over the water droplets. In filtering through sand or similar porous materials the effect is to remove the asphaltic substances from the crude oil, thus weakening the film on the water globules.

Cracking

Recent Advances in Oil Cracking. Dunstan and Pitkethly. (World Power Conference, London, 1928. Petroleum Times. Oct. 20, 1928. p. 719. Libr. Bull., U. O. P. Co., Vol. 3, Nos. 45, 46.) In 1927 over 100,000,000 barrels of gasoline was produced in the United States by cracking, and over 1,000,000 tons of petroleum coke. The development of cracking has kept

At Last!



a practical

Louis Allis explosion-proof self-ventilated A.C. Motor.

Explosion-Proof Motor for Refinery Service

Tested and Listed by Underwriters' Laboratories . . . For use wherever gasoline is made, used, or handled . . . The only approved explosion proof motor of self ventilated type . . . Weight is only half that of non ventilated motor—and but slightly greater than ordinary open motor . . . Can be installed in practically same space as open motor . . . It is suitable, therefore, for mounting direct on pumps, etc. . . . It brings to refineries for the first time the economy and convenience of a small, safe, direct motor drive—without use of fire walls . . . Permitted under National Electrical Code.

Practical—Safe—Economical

Standardize on this Louis Allis motor for your plant. Specify it on machines that you buy.

Sizes 1 to 15 H.P. available now, 1 to 30 H.P. in near future.

Write for descriptive pamphlet.

THE LOUIS ALLIS CO.

Motor specialists for 27 years Milwaukee, Wis. *Offices in principal cities*

pace with the increase in motor transport, preventing the depletion of petroleum deposits and the accumulation of great quantities of residual oils. The cracking art has been improved in recent years by better pyrometry and automatic control, improved heat transfer, more economical furnaces, the recirculation of hot flue gases, and the use of hot oil circulating pumps instead of dependence upon gravity. All the commercially successful processes are noticeably simple in apparatus and operation. The processes which use electrical heating and catalysts or any complicated arrangements have not succeeded. The principal processes in commercial use differ mainly in the size and design of the reaction chamber and in the operating procedure. The Dubbs plant has a large reaction chamber which fits it for cracking heavy oils with the necessarily heavier deposition of coke. The yield of gasoline depends, in the range of cracking temperature, upon temperature when the time is constant; in this range the yield doubles approximately for every 10 degrees C. rise in temperature. With temperature constant the yield is proportional to the time till advanced decomposition is reached. Time and temperature also are related to the pressure required to maintain the cracking oil in the liquid phase since the critical temperature falls as the proportion of cracked products increases. There is an optimum yield for each pressure, beyond which distillation proceeds so rapidly that heavy ends accumulate and excessive amounts of carbon are deposited. The higher the pressure, the higher the optimum yield.

Paraffin-base oils cracked in the liquid phase yield gasolines which are similar in chemical character to themselves. Cracked in the vapor phase, however, they yield a gasoline of good anti-knock qualities and unlike either the straight-run or the liquid phase cracked product. Certain shale oils when cracked in the liquid phase gave a worse knocking motor fuel than the straight-run product.

Pressures used in the Cross process range from 600 to 850 pounds per square inch and the oil is held in the liquid state almost completely even in the reaction chamber. Temperature as passing from the heating zone varies from 450 to 480 degrees C. (482 to 896 degrees F.) The process has been improved in recent years by replacing the welded reaction chamber with a one-piece forged steel chamber; instead of towers yielding pressure distillate, bubble-cap towers are now provided which give a fractionation so complete that there is no overlap between E.P. of gasoline and I.B.P. of reflux; the Kellog-Alcorn radiant-heat furnaces are now used; and fuel consumption in excess of fixed gas burned has been reduced to 0.5 per cent.

Within three or four years the Dubbs cracking plant has been enlarged and improved in several respects. Instead of 50 four-inch heating tubes, a unit may now have 135 five-inch tubes. Instead of a 10 x 15 foot reaction chamber, the dimensions are now 10 feet x 40 feet high. The dephlegmator has been enlarged and the reflux leg shortened since the hot-oil pump has come into use. Flue gases are recirculated. Some units have duplicate reaction chambers, so that coke may be cleaned out of one while the other is operating. The residuum in the reaction chamber may now be passed to a six-foot x 12-feet flash chamber where pressure is reduced and additional light fractions separate. This method of operating reduces the coke deposits 80 per cent. or more. The pressure distillate is of better quality, and the residuum has a low cold test, high flash point and low free carbon. The vapors from the flash chamber pass by a six-inch line to a condensing and preheating column with 12 pans in the top where the vapors are condensed by cold charging stock pouring over the pans. A Tagliabue liquid-level control in the column governs the amount of steam to the hot-feed pump; so that if a large amount of gas oil is flashed off, the pump speeds up to maintain a constant level in the column. The hot feed is pumped from the bottom of the column either to the dephlegmator or to the cracking tubes. The fuel-oil residuum in the bottom of the flash chamber may be pumped around the fuel-oil system to storage or part of it may be returned to the flash chamber to lower the gravity

Refinery Walkway (Type A)

ARROWHEAD GRATING AND TREADS
For the Oil Industry

ARROWHEAD GRATING
Type A—For Walkways.
Type H—For Floors.
Type M—Rectangular.
Strong—non-slippable—well-appearing.

ARROWHEAD TREADS
The heavy nosing bar defines front.
The non-slip quality makes them safe.
They bolt direct to stringers.
Write for our Handbook

ARROWHEAD IRON WORKS, Inc.
431 West Fifth Street Kansas City, Missouri

Mention Where You Saw the Advertisement

A Complete Line of High-Heat-Duty Refractories for *Boiler Settings—Stills—Oil Heaters*

Fire Brick in Mouldable Form

High-Heat-Duty Fire Brick

Dry Refractory Cement

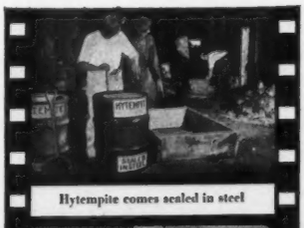
Air-Setting Refractory Cement

Branch Offices and Representatives

EL PASO	NEW YORK	RENO
HOUSTON	SAN FRANCISCO	PHOENIX
WICHITA FALLS	LOS ANGELES	SANTA FE
SALT LAKE CITY	ALBUQUERQUE	

THE DENVER FIRE CLAY COMPANY

DENVER DFC COLORADO


Hytempite comes sealed in steel

Always ready for use

Thinning to a Pancake Batter

Hytempite Batter stays in Perfect Suspension

Reduce Costly Repairs and Shut-Downs with

HYTEMPITE

(Reg. U.S Pat. Off.)

The Universal High Temperature Cement

HYTEMPITE is universally used because it

—is easy to use
—makes a thin joint
—permits hot patching
—comes sealed in steel
—insures reduction of heat losses
—reduces amount of fuel consumed
—makes a tough bond throughout the wall
—resists destruction from constant vibration
—expedites repairs—prevents long shut-downs
—eliminates the possibility of shrinkage cracks
—allows furnace operation at high temperatures
—makes a perfect seal—prevents infiltration of air
—air sets and does not depend on heat for strength
—retains strength at temperatures at which fire brick fail
—can be shot in place with a Quigley Refractory Gun
—is ideal refractory, when used with crushed old fire brick

Let us help solve your furnace problems. Write to us.

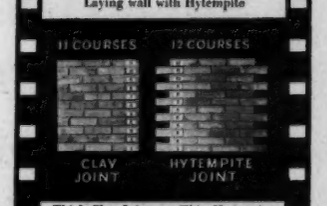
QUIGLEY
Furnace Specialties Co., Inc.

26 Cortlandt Street New York

Stock and service in over 100 important industial centers throughout the world

Shows thin joint obtained

Laying wall with Hytempite



Thick Clay Joints vs. Thin Hytempite Joints

Hytempite Joints have great strength

HYTEMPITE is a Product of the Quigley Furnace Specialties Co., Inc.

of the residuum and reduce coke formation.

Treating

The Action of Strong Sulfuric Acid on Olefines and Alcohols. Ormandy and Craven. (*J. I. P. T., Dec.* 1927, *p.* 844. *Libr. Bull., U. O. P. Co., Vol.* 3, *No.* 8, *p.* 77-78). As to previous work upon the action of concentrated sulfuric acid upon olefines or alcohols, Plant and Sedgewick reported that 97 per cent acid absorbed 50 per cent of propylene in 2 hrs. and a colorless oil was extracted which was thought to be a mixture of open-chain secondary alcohols; Berthelot in 1894 published the observation that propylene introduced into sulfuric acid gave di-isopropyl sulfate which separated and was decomposed and dissolved by cold water; Ormandy and Craven, 1927, ran a mixture of amylenes into 3 volumes of 98 per cent sulfuric acid and obtained 70 per cent of a mixture of saturated hydrocarbons, probably paraffins; and when the acid was diluted and steam-distilled obtained a highly unsaturated oil, believed to contain tri-olefines.

This is now shown to be general for olefins and their parent alcohols containing 3 or more carbon atoms. When these are passed through an excess of sulfuric acid, saturated hydrocarbons separate out either at once of on standing over night, and the wash acid when diluted yields an oil whose character is not fully understood but which is shown by its bromine absorption to be highly unsaturated. Ethylene and methyl and ethyl alcohol gave no hydrocarbons when run into concentrated acid. Ethylene yielded ethyl alcohol. Propylene appeared to have first been hydrated to isopropyl alcohol and this gave the alkyl sulfate, which was followed by the formation of the saturated —probably paraffin—hydrocarbon.

Amylene, the higher olefines from narrow boiling-range fractions obtained by cracking, isopropyl alcohol under varied conditions of experiment, n-propyl and amyl alcohols, cyclohexanol, and the three methylcyclohexanols were subjected to trial, and the findings were as above stated, except when isopropyl alcohol was passed into 102.6 per cent. H_2SO_4; this yielded only traces of paraffins. Yield, gravity, molecular weight, refractive index, distillation curve, and percentage carbon hydrogen were determined in each case for the saturated hydrocarbon mixtures. Density, refractive index, and elementary analysis are also reported for the unsaturated acid wash oils from the open-chain starting materials.

Isopropyl alcohol contains 60 per cent. of carbon; and when 100 c.c. of the carefully fractionated Howard's absolute "Avantine" was dropped slowly into 500 c.c. of 98.5 per cent. H_2SO_4 keeping the temperature below 25° C. (77° F.), the carbon in the paraffin mixture, in the acid wash oil, and in the unchanged alcohol totaled 60.1 per cent.; showing that the first two constituted all the products of the reaction.

Alcohols and olefins from open-chain paraffins gave open-chain paraffins; alcohols from cyclic paraffins gave cyclic and polycyclic paraffins.

* * *

Engineering

The Radiation Pyrometer. Hartenheim. (*Instruments, Oct.* 1928, *P.* 443). The thermocouple pyrometer, subjected as it is to the high temperature to be measured, undergoes change with use and gives incorrect indications. The radiation pyrometer utilizes the total radiation given off by a glowing body and has the special advantage of extending upward the range of temperatures which may be indicated to almost any height desired.

Kirchhoff's studies showed that if all the radiations from a source of heat are absorbed by a body and none are reflected or transmitted, then the temperature has a definite relation to the energy radiated by the body. The Stefan-Boltzmann law states that the energy radiated is proportional to the fourth power of the absolute temperature: $E = CT^4$, in which C is a constant depending on the energy units used. The more recent radiation pyrometers converge all the heat radiation by means of lenses on to a small thermocouple in the circuit of which there is a galvanometer. Fine wires are used for the thermocouple, which prevents time lag almost entirely. The deflection of the galvanometer pointer being proportional to the fourth power of the temperature, the scale in the galvanometer will show continually increased instead of equal spacings.

(*Continued on page* 118)

The
EDELEANU PROCESS

Refining with liquid Sulphur Dioxide

NO loss of distillate

NO production of acid sludge

NO plant corrosion

NO loss of SO_2

YIELDS highest grades of

KEROSENE

TRANSFORMER OIL

TURBINE OIL

LUBE OILS

WHITE OILS

MEDICINAL OILS

In use by leading refiners in the United States and foreign countries. For information write

AGEFCI

11 West 42nd St., New York, N. Y.

Cost of Power Nominal

THE DE LAVAL TURBINE here shown receives steam at 160 lbs. pressure and exhausts under 22 lbs. back pressure to an oil refinery process.

The DE LAVAL CENTRIFUGAL PUMPS are designed to handle respectively 1000 gals. per min. of water against 70 ft. head, 175 gals. of lean oil of .71 specific gravity at 140° F. against 254 ft. head, 185 gals. per min. of rich oil of .81 specific gravity at 90° F. against 157 ft. head and 60 gals. per min. of reflux of .8 specific gravity at 120° F. against 68 ft. head. A positive acting pump was formerly used in this work exclusively, but the turbine driven centrifugal pumps have proved superior in every way.

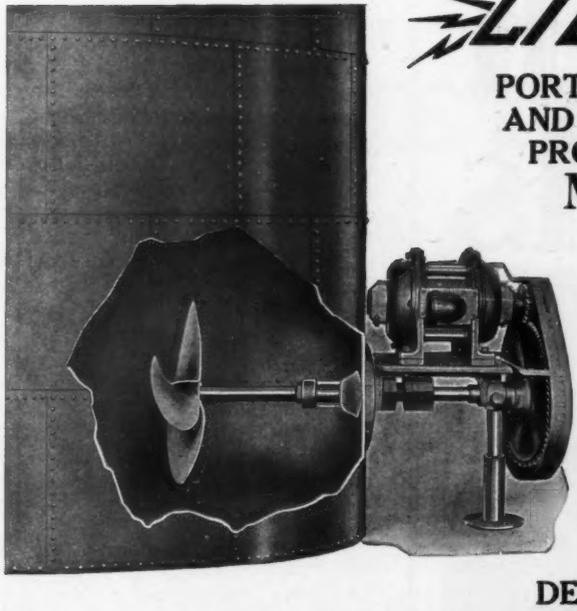
De Laval pumps are manufactured to limit gages on an interchangeable basis. All parts are made of material best adapted to the respective purposes. A guarantee of characteristics is backed by thorough testing at the Works.

Ask for catalog B-116.

De Laval Steam Turbine Co.

Trenton, New Jersey 3014

Manufacturers of Steam Turbines, Centrifugal Pumps, Centrifugal Blowers and Compressors, Double Helical Speed Reducing Gears, Worm Reduction Gears, Hydraulic Turbines, Flexible Couplings and Special Centrifugal Machinery.

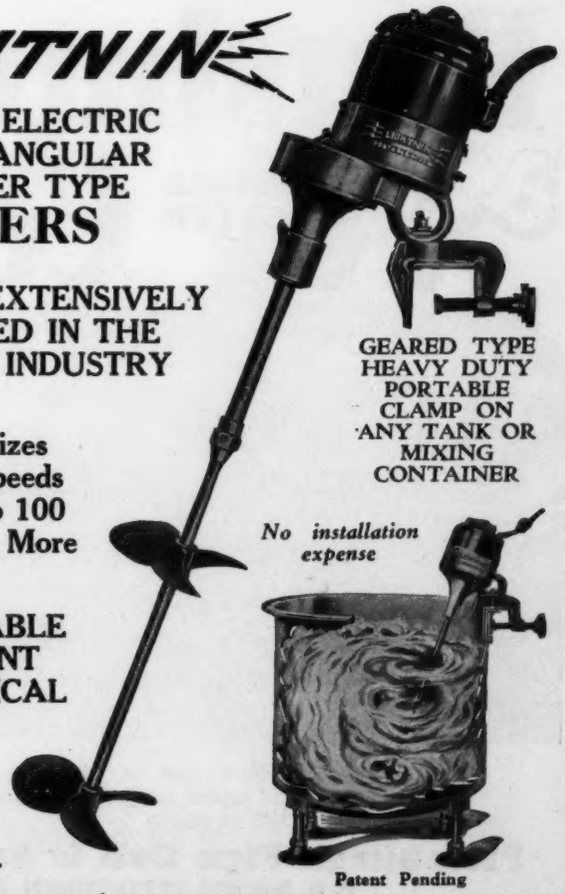


LIGHTNIN

PORTABLE ELECTRIC AND SIDE ANGULAR PROPELLER TYPE **MIXERS**

ARE EXTENSIVELY USED IN THE OIL INDUSTRY

All Sizes and Speeds 1-20 to 100 H.P. or More



GEARED TYPE HEAVY DUTY PORTABLE CLAMP ON ANY TANK OR MIXING CONTAINER

No installation expense

SIDE ANGULAR PROPELLER TYPE AGITATOR FOR TANKS OF ANY SIZE OR SHAPE

DEPENDABLE EFFICIENT ECONOMICAL

Patent Pending

Mixing Equipment Co., Inc.

229 EAST 38 ST. NEW YORK, N. Y.

DIXON'S GRAPHITE SEAL

for any point where there is no water present

DIXON'S Graphite Seal fills a long felt need for a sealing paste that would *effectively seal* tank hand-hold and manhole plates: air, vacuum, gas, vapor, and high pressure steam lines; cylinder heads, oil burners, gasoline engines, Diesel engines, turbines, generators, pumps, and similar equipment used to handle mineral, animal and vegetable oils. It is not to be used on water lines.
It makes a screw thread, flange or gasket joint tight . . . sealed . . . and is not soluble in hot or cold oils, gasoline and similar solutions.
Every industrial plant has numerous uses for this product. Every maintenance man should be familiar with its ability to make joints *leak-proof and permanently tight.*
The full story is in Circular No. 99-DS, a copy of which is yours for the asking.

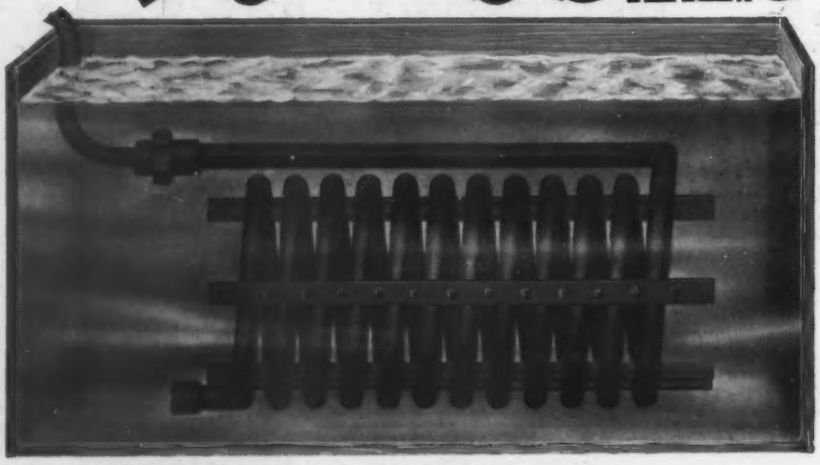
JOSEPH DIXON CRUCIBLE CO.

Jersey City New Jersey

Established 1827

Pittsburgh

AIR PRESSURE TESTED **Coils**



NOT a leak in a mile of Pittsburgh-built Coils; factory-tested under air pressure while submerged in water. Let us quote.

Pittsburgh Pipe Coil & Bending Co.

P. O. Box 975, PITTSBURGH, PA.

OF PARTICULAR INTEREST TO THE CHEMIST

Testing and Analysis

(*Continued from page* 116)

From: The Natural Gases. Stockfish. (*Petroleum, July* 20, 1928, *p.* 907. *Libr. Bull., U. O. P. Co., Vol.* 3, *No.* 32). The determination of the methane homologs by the ordinary methods of gas analysis is very problematical. If fairly large quantities of gas are available the method of analysis by condensation is the best. This was worked out some years ago by Erdmann and Stolzenberg and by Lebeau and Damien. Improvements were made in the apparatus by Tropsch and Dietrich in 1925. The gas mixture is cooled down till it is partly liquefied and the vapor pressure of the higher-boiling compounds at the boiling points of the lower-boiling is so small that it may be neglected. The method is also applicable to the olefin series. The determination of the rare gases has become important in recent years and this may be accomplished by passing the gas residues over incandescent calcium.

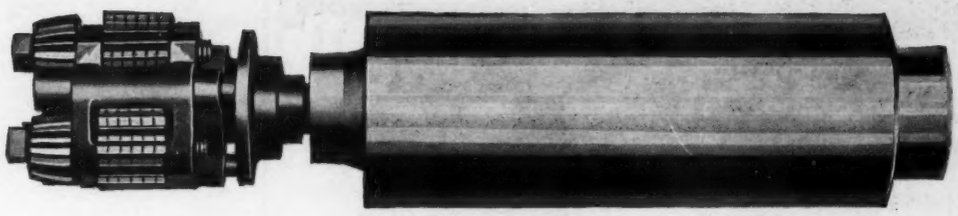
* * *

Laboratory Cooling Device Using Liquid Sulfur Dioxide. Gill. (*Ind. and Eng. Chem., Vol.* 20, *No.* 2, *p.* 212). Describes method used in employing liquid sulfur dioxide in determining cold test of castor oil for lubrication of aircraft engines wherein oil must be maintained at minus 10° C. for 10 days. Slow boiling was maintained by keeping the liquid in a Dewar flask of about 5 c.m. internal diameter. The castor oil to be tested was placed in an 18 mm. test tube, with a thermometer running through the stopper to the bottom of the tube. The stopper was thickly coated with vaseline to exclude moisture and sulfur dioxide. When placed in the sulfur dioxide the oil varied in temperature by less than half a degree, the normal temperature being 10° C. minus. The only attention required was the addition of 100 c.c. of sulfur dioxide every second day. As the temperature was sufficiently constant, no thermometer was needed in routine use and hence the ends of the test tube were sealed off in the flame. Rapid collection of liquid sulfur dioxide from the cylinders are accomplished by using the familiar spiral condenser surrounding a glass reservoir. Care must be taken that the cold liquid attain its boiling point before putting it into the Dewar; otherwise, it will stay supercooled for a considerable time and subject the oil to too low a temperature.

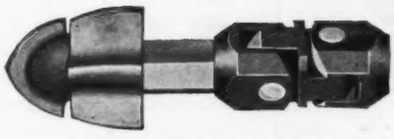
* * *

Determination of the Constitution of Inorganic Substances by Spectroscopic Methods. Strecker and Spitaler. (*Ber.* 59 *B,* 1754-1775 (1926). *B. C. A.-A, Nov.,* 1926, *p.* 1082. (*In part*). Difference in optical properties is observed between a dialkyl sulfide and the corresponding sulfoxide and between symmetrical and unsymmetrical sulfites, whereas the transformation from sulfoxide to sulfone or from symmetrical sulfite to sulfate has no effect. The constancy of molecular refraction is due to the balance between the increment caused by the addition of the

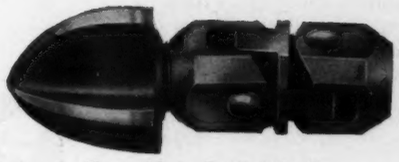
ROTO TUBE CLEANERS



Roto air-driven Cleaner for Oil Still Tubes, made in sizes for 3″ tubes and larger.



Roto Still Type Drill Head



Roto Unit Drill Head

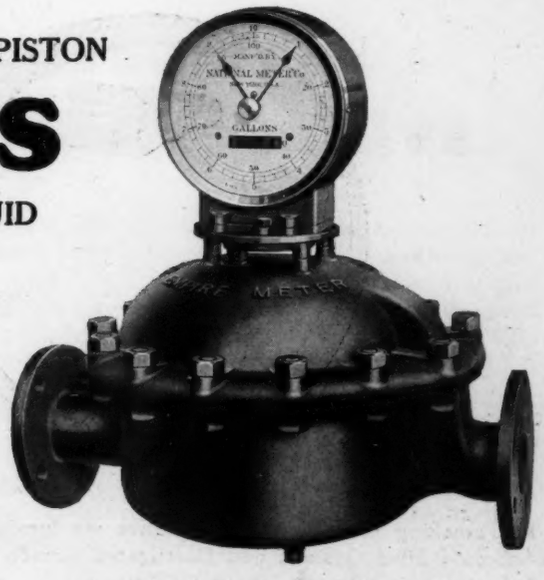
THE ROTO CO. **Sussex Avenue and Newark St.,** **NEWARK, N. J.**

POSITIVE DISPLACEMENT OSCILLATING PISTON

OIL METERS

FOR PETROLEUM AND ALL ITS LIQUID PRODUCTS

Entirely different from any other type of oil meter



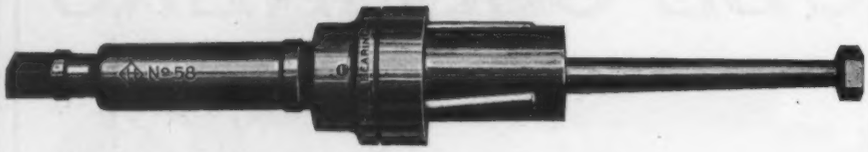
The EMPIRE

In successful use for over forty years. Never equaled for *lasting* accuracy. Easy to install and operate. Very low in maintenance cost. Invaluable for Refinery work. All sizes from 5/8″ to 6″ inclusive. Made to withstand working pressures of 300 pounds to the square inch. Standard types for general use will sustain 150 pounds. Special types for still higher pressures and for special requirements.

Send for fully descriptive circular and EMPIRE information sheet, and let us make recommendations for your particular service. This is quite without obligation. Ask for Form R.

NATIONAL METER COMPANY 299 BROADWAY NEW YORK CITY

Heavy Duty Expanders for Still Tubes



Tools for the Oil Industries

Hydraulic Pressure Pumps, 8000 pounds
Tube Expanders for Cracking Still Tubes
Hydraulic Pressure Pumps, 2000 pounds.
Tube Expanders for Condenser Tubes
Hydraulic Pressure Pumps, 500 pounds.
Tube Expanders for Steam Boilers
Screw Punches for Structural Shapes
Tube Expanders for Pipe Work
Screw Punches for Plate Work
Flaring Tools for Still Tubes
Beading Tools for Still Tubes
Hydraulic Jacks
Hydraulic Punches

A. L. HENDERER'S SONS

Wilmington, Del.

Established 1870
Expanders since 1884

For cracking process in oil refineries we furnish Aluminum Armored Asbestos filled Gaskets and Corrugated Armco Iron or Monel Metal Asbestos encased.

Copper rings 3/16" thick for 4 and 5" O. D. tubing.

Washers or gaskets made of Aluminum, Copper and other Metals.

Write for Prices.

METALLO GASKET CO.

NEW BRUNSWICK, N. J.

oxygen atom and the decrement due to the balance between the increment caused by the addition of the oxygen atom and the decrement due to the passage of the sulfur atom to a higher state of valency. The results of optical investigation harmonize most satisfactorily with the constitutions.

$R_2S\begin{matrix}O\\O,\end{matrix}$ $O:S(OR)_2$, $\begin{matrix}R\\RO\end{matrix}S\begin{matrix}O\\O,\end{matrix}$ and $(RO)_2S\begin{matrix}O\\O,\end{matrix}$

for sulphones, symmetrical and unsymmetrical sulfides, and sulfates, respectively.

Physical data are given for many organic sulfides, sulfoxides, sulfones, sulfites and sulfates.

RESULTS OF RESEARCH AND INVESTIGATIONAL WORK

General

Separation of Classes of Hydrocarbons. Manning (*J. I. P. T., Dec.* 1927, *p.* 820—*from discussion of Brame and Hunter's paper upon cracked distillates.*) In the course of some work at H. M. Fuel Research Station upon light oils from low-temperature carbonization, which are probably similar to cracked distillates, it was concluded that no strength of sulfuric acid would clearly separate olefins from aromatics. The plan was adopted of using a nitrating mixture, 10 per cent. nitric acid in sulfuric. This did not attack the naphthenes and paraffins to the extent of more than one-half per cent. A separation can be made therefore between aromatics and olefins on the one hand and the saturates on the other. The aromatics can be determined as the nitro compounds, the olefins by difference. The details of the method are probably to be published soon.

The Near Future of Naphthene Petroleums. K. Kostrine. (*Neftyanoe Khozyaistvo* 9, 754-6 (1925); *Chem. Zentr.* 1926, 1,2990. *C. A., Nov.* 20, 1927, *p.* 4056.) Because of the poisonous properties of $PbEt_4$, attention is being given to the utilization of naphthenes or C_6H_6 (though the combustion of C_6H_6 involves the formation C) as anti-detonators. Since the anti-detonator effect usually increases with the proportion of C in the molecule, and since hydrocarbons poor in H have higher densities than hydrocarbons rich in H, of the same boiling points, the fuel with the higher density for a given boiling point shows the highest temperature of explosion. In this respect Baku benzine is superior to all American products.

Catalytic Formation of Petroleum Hydrocarbons from Fats. Marcusson and Bauerschafer. (*Petroleum Zeitschr.* 22, 815 (1926). *B. C. A.-., Dec.* 10, 1926, *p.* 970.) The conversion of fats occurs at lower temperatures than those employed by Mailhe, the products obtained by whom were secondary. At low temperatures, avoiding distillation, heavy discous oils are obtained as a primary product. Oil or fat was mixed with 20 per cent. of its weight of kieselguhr or sodium chloride

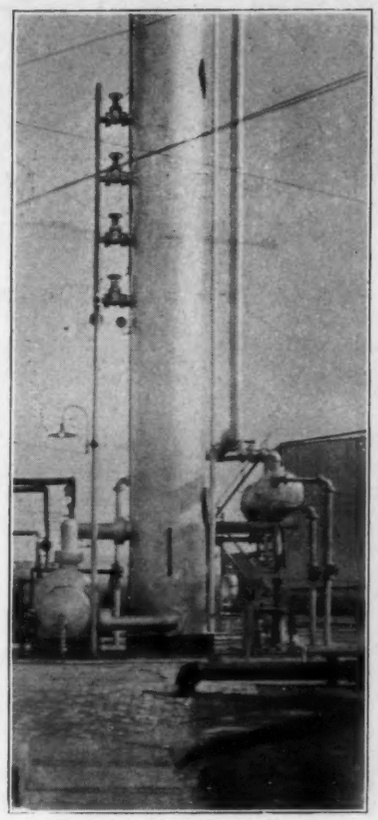
The Trend of the Times

GASOLINE FRACTIONATION

ERECO FRACTIONATING EQUIPMENT

Built for all gasoline products:

Liquid Gas
Gas Machine Gasoline
Aviation Gasoline
Stable Gasoline
Special Products



ENGINEERING, RESEARCH & EQUIPMENT CO.

Consulting, Research, Design, Manufacturing, Construction
Absorption Plant and Refinery Equipment

655 Roosevelt Building,
Los Angeles, Calif.,
Phone TRinity 4661

ERECO DUPLEX

1313 Athletic Building,
Dallas, Texas
Phone 26310

Former Cost 48c

14c is the cost now

Oakite Service Men, cleaning specialists, are located in leading industrial centers of U. S. and Canada

Figures that speak for themselves

EIGHTEEN pounds of a former material were used daily in washing gasoline and oil trucks at one oil company's garage. Now only one and a half pounds of an Oakite material do the same amount of work. Materials cost has been reduced from 48 cents to 14 cents per truck.

Savings such as these show why so many concerns in the oil industry have standardized on Oakite materials and methods for every sort of cleaning job. And the amount of hand scrubbing eliminated—the time saved—brings down costs still further.

One of our Service Men is near you. He will come at your call and show you how you can profitably employ Oakite cleaning. Write to him today. No obligation.

Manufactured only by

OAKITE PRODUCTS, INC., 50B Thames St., NEW YORK, N. Y.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

Mention Where You Saw the Advertisement

THE R.S.C. TULSA SERVICE ACCURACY

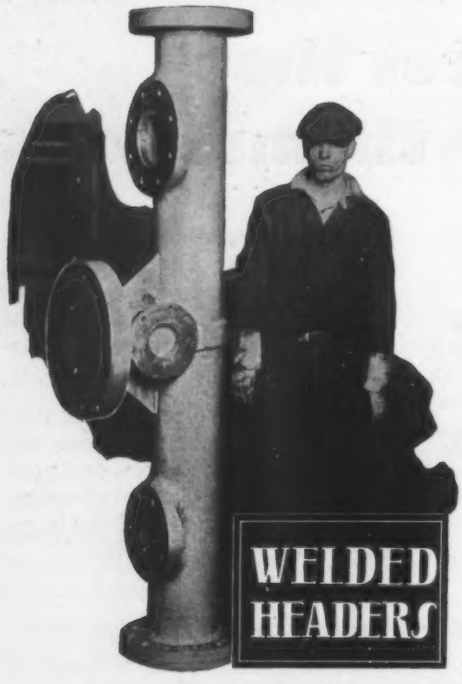
Largest Scientific Material House in the Southwest, Including Complete Line of

TAG
Oil Testing Instruments, Etc.

HAYS
Gas Analyzers, Etc.

MERIAM
Manometers including Flow Meters, Etc.

The Refinery Supply Company
Tulsa, Oklahoma Dallas, Texas



Power Piping
FOR EVERY OIL FIELD NEED

Of the many ramifications of this company's service to the oil industry, no feature has better proved our fitness in the field than the special welded work we are called upon to produce.

Headers, manifolds, fittings, pipe of all varieties —welded and fabricated to the most exacting specifications. Prompt and economical, too!

POWER PIPING CO.
PITTSBURGH, PA.

and boiled for 20 hours, under a reflux condenser, the temperature not exceeding 300 degrees. The product freed from catalyst and saponifiable matter, was fluorescent and, according as the starting material was linseed oil or tallow, had a sp. gr. of 0.92 or 0.87, and an iodine value of 52 or 29. The acetyl values were 13 and 16, and the acetyl values of the products 32 and 61, respectively.

Lubrication and Lubricants

From: Refining in Europe. Waterman and Perquin. Transformer and Lubricating Oil.—Dowaldson (J. S. C. I., 1927, 324T. Progress of Naphthology during 1927. J. I. P. T., Aug. 1928.) The points which have to be considered in selecting an oil for cylinder lubrication in a heavy-oil engine are whether to use a large quantity of a light oil which will volatilize rapidly at a lower temperature and leave a small deposit, or to use a smaller quantity of a heavy oil which will volatilize more slowly at a higher temperature, but will leave a much heavier deposit. Generally, it is advisable to use the minimum quantity of an oil as light-bodied as possible, consistent with good lubrication and the temperature of running parts, so as to obtain the smallest quantity of carbon deposits.

Bearing Lubrication of Vertical High Speed Steam Engines. (Commonwealth Engr., Vol. 14, No. 11, June 1, 1927, pp. 433-35.) Describes forced-feed circulation system and stresses importance of keeping system and oil clean by giving it daily attention; shows economic advantages of using correct oil.

Modern Lubrication Devices for Machine Tools. Weil. (Maschinenbau, Vol. 6, No. 18, Sept. 15, 1927, pp. 899-904. Mech. Eng., Vol. 49, No. 12, p. 1380.) Describes apparatus for central lubrication, particularly pressure lubrication, illustrating with a number of practical examples.

Dot Centralized Lubricating System. (Am. Mach., Vol. 67, No. 24, Dec. 15, 1927, pp. 953-954.) Number of bearings upon machine or group of machines or upon line and countershaft are oiled simultaneously from a central point; comprises pump or means to introduce oil, metering valve, knuckle relief valve, pipe and fittings; hand or power operation.

Motor Fuels and Knock-Preventing Agents

The Activity of Anti-Knock Agents in the Vapor Phase. Aubert, Dumanois and Pignot. (Compt. rend., 186, 1928. Brenn.-Chem., Sept. 15, 1928, p. 304. Libr. Bull., U. O. P. Co., Vol. 3, No. 40.) A report of experiments with different anti-knock reagents in an arrangement similar to the Falks apparatus. The duration of the pressure rise served as the standard of comparison. According to their view the activity of lead tetraethyl and the other substances investigated is due to their insuring the stepwise oxidation of the hydrocarbons and delaying the explosion wave.

Thallium for the Prevention of Knock-

HAVING GASKET PROBLEMS?

LET US SOLVE THEM FOR YOU!

We make metal gaskets of any size or shape, plain or corrugated, with or without asbestos, also plain solid washers of copper, aluminum, monel metal or any material desired. Our Gasket Guide shows a very complete line of gaskets suitable for refinery work.

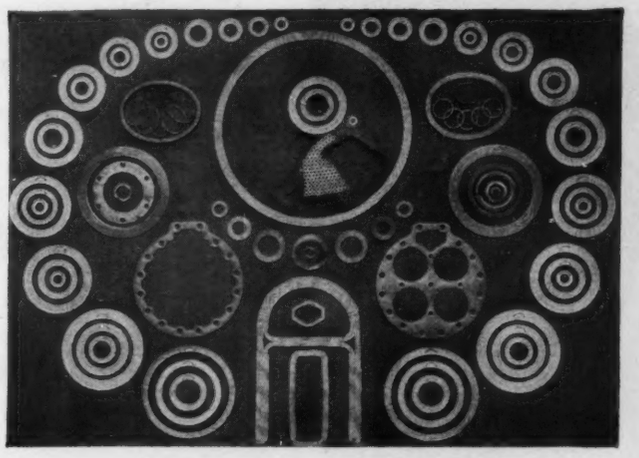
Copy sent upon request.

GOETZE

GASKET & PACKING CO., Inc.

P. O. Box 175

NEW BRUNSWICK, N. J.



A Few Types of Goetze Gaskets

"RUBSHELL"

Naphtha-Proof A SUPER PAINT **Acid-Proof**

Solves the "Sour Stock" Corrosion Problem

Insoluble in Gasoline vapor or liquid, "Rubshell" is invaluable for the internal protection of the bottoms and vapor space of run-down, working and storage tanks, being particularly effective in combating the more severe forms of corrosion resulting from the handling of "Sour Stocks."

"Rubshell" being Acid-Proof also perfectly protects the exteriors of acid eggs, fume towers, and treating plants.

SEND for your copy of "Further Proof" summarizing the experience of a score of refiners in combating "Sour Stock" corrosion.

Sole Manufacturers

International Compositions Company, Inc.

25 Broadway, New York, N. Y.

Agent for Oklahoma and Texas
NATIONAL TANK SEAL CO., Tulsa, Okla.

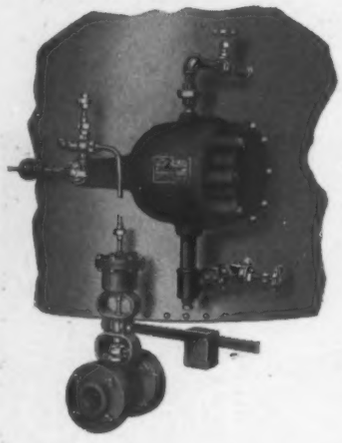
Agent for California
C. G. CLINCH & CO., SAN FRANCISCO AND SAN PEDRO

Agent for Louisiana
WOODWARD, WIGHT & CO., LTD., NEW ORLEANS

A NEW TYPE

CF Regulator

for Maintaining Liquid Levels in Refinery Operations



Maintains constant level under all conditions of temperature and pressure. May be used to control the outlet or inlet flow.

Get the latest information as presented in our new bulletin describing this regulator.

Chaplin-Fulton Mfg. Co.
28-40 Penn Avenue
PITTSBURGH, PA.

VIGILANT
LIQUID LEVEL REGULATORS

TUBE TURNS

A NEW AND EXCLUSIVE PROCESS

We are pleased to announce to the trade that we are distributors for
TUBE TURNS, Inc.
LOGAN ST. AND GOSS AVE.
LOUISVILLE, KY.

No thinning of outside wall or buckling of inside wall. Greater strength, less friction, longer life.

Wide Applications

Used to provide any kind of elbow, off-set, branch, or return bend in welded piping. To replace cast fittings and mitre-welded elbows, or wherever a tight, flexible, safe, SEAMLESS drawn fitting of low friction resistance will improve the installation.

Immediate delivery of standard sizes from either our own warehouse, or from stocks at Louisville, Ky. Price lists and descriptive bulletins mailed on request.

Maintenance Engineering Corporation
1400 Conti St. Phone Preston 2274-5
Houston, Texas

ing. (*Petroleum Times, Dec.* 10, 1927, *p.* 1124.) A British patent has been granted to the Asiatic Petroleum Co., Ltd., London, and A. C. Edgerton for an invention relating to the prevention of knocking in internal-combusion engines by the use of thallium vapor or the vapor of some thallium compound, as the oxide, or, if a soluble compound is used, thallium benzylate, phenylethylate, oleate, amyl alcoholate, thallium ethyl, or thallium acetoacetate. If an insoluble form is used it may be vaporized outside of the engine cylinder by an electric arc and the vapor carried into the cylinder by a current of air or other gas. Or, the metal or insoluble compound may be suspended in the fuel.

The Role of Metallic Colloids in the Suppression of Detonation. Olin, Read and Good. Ind. and Eng. Chem., Vol. 18, *No.* 12, *pp.* 1316-18. *Libr. Bull., U. O. P. Co., Dec.* 18, 1926, *p.* 5.) No theory of the action of anti-detonants has so far been generally accepted. However, in view of the fact that the best anti-detonants known are metallo-organic compounds, which in combustion decompose to form deposits of finely-divided metallic particles, it was thought of interest to learn whether the metals in colloidal form would have a similar anti-detonant action in gasoline. Tests were made in the engine of a Harley-Davidson motorcycle with colloidal lead and colloidal nickel. No evidence was found to show that the colloidal suspensions affected detonation.

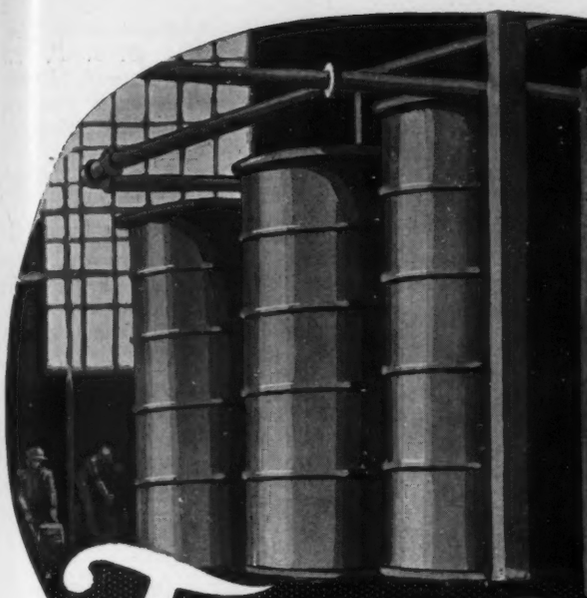
Fuel for the Wright "Whirlwind." (*Aviation, Vol.* 23, *No.* 20, *Nov.* 14, 1927, *pp.* 1170-1172.) Of the hundreds of new fuels recently put on market only two have been recognized as being satisfactory by Army and Navy Air Services. These are gasoline blended with benzol or with tetraethyl lead, and even these fuels must be used with caution, as it is not sufficient to insure suitable anti-knock value unless other requirements as to purity and volatility are complied with.

New Products

Voltol Oils. (*Chem. and Ind., Sept.* 21, 1928, *p.* 974. *Libr. Bull., U. O. P. Co., Vol.* 3, *No.* 41.) Voltol lubricating oils produced by subjecting oils to the glow discharge are now being made commercially by the Deutsche Voltolwerke near Dresden, Ger. The oil is placed in a horizontal cylinder of 30 cu. m. (792.5 gal.) capacity. A horizontal axis containing four systems of aluminum electrodes of 400 sp. m. area (478.4 sq. yds.), is slowly rotated. The glow discharge is produced by an A. C. machine, which gives a temperature of 60 to 80 degrees. Hydrogen is pumped off as formed, the degree of vacuum being such as to give a current of 23 amps. Viscosity of voltol oils is much less affected by temperature than that of other oils.

New Uses

Utilization of Ethylene Obtained by Cracking of Petroleum for the Production of Alcohol. (*Gerr and Popov. Neftyanoe Khozyaistvo,* 10, 88-2 (1926). *C. A., Aug.* 20, 1927, *p.* 2788.) Gas obtained from solar oil by cracking consisted of 54 per cent. of methane and its homologs, 12.2 per cent. of hydrogen, and



There are hundreds of uses for Tycos Temperature Instruments in the Oil Industry for it is exceeded by few in the number and diversity of its temperature requirements.

Tycos Temperature Instruments are rendering excellent service to oil operators all over the world. It is with confidence, therefore, that we recommend these sturdy, reliable instruments for *your* refinery.

Our engineers will demonstrate why their uniform results and low upkeep make them worthy of being made the standard at your refinery.

Tycos Temperature Instruments

INDICATING - RECORDING - CONTROLLING

There's a Tycos or Taylor Instrument for Every Purpose

Taylor Instrument Companies
Rochester, N.Y. U.S.A.
Canadian Plant
Tycos Building, Toronto, Canada.

"Everything for Mine and Industrial Safety"

M-S-A TANK GAUGERS MASKS

Afford Complete Protection Against Hydrogen-Sulphide Gas and Other Fumes from Sour Crudes and Distillates. Two Types Available.

Write for Bulletin No. 100

Type "C" Mask

A Canister Type Mask with single inhalation tube.

Developed especially for Tank Gaugers, Pipe Line Inspectors and Repairmen, Pumphouse Men and others who may be exposed, in unconfined places, to deadly Hydrogen Sulphide Gas from Sour Crudes and Raw Distillates. Supersize Canisters are used in all M-S-A Tank Gaugers' Masks.

Type "C" Mask in Use

M-S-A Hose Masks (Fresh Air Type) should be used in all confined spaces where Deficiency of Oxygen or High Concentrations of Petroleum Vapors may exist. Write for literature.
Manufactured only by the

Mine Safety Appliances Co.
Braddock Ave. & Thomas Blvd., Pittsburgh, Pa.

Type "D" Mask

A Canister Type Mask with double inhalation tube.

The Face Piece fastens to the two Flexible Inhalation Tubes, one over each shoulder, joining a substantial Y connection in the back between the shoulders. This arrangement assures the wearer an uninterrupted supply of air, even though one tube be temporarily closed.

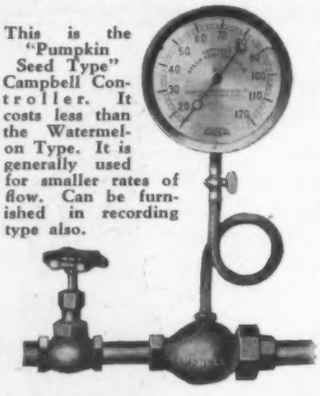
Campbell CONTROLLERS for OIL STILLS

Campbell steam flow controllers are applicable to oil stills of all sizes. They do three things simultaneously: (1) Control the rate of flow; (2) Record; and (3) Give a direct reading.

This is the "Watermelon Type" It takes care of two delivery points, proportionately

These devices are unequalled for controlling steam flow to low pressure vessels at constant flow rate. Let us refer you to some large oil refineries who are now using them.

This is the "Pumpkin Seed Type" Campbell Controller. It costs less than the Watermelon Type. It is generally used for smaller rates of flow. Can be furnished in recording type also.



Campbell Controllers record or indicate in pounds of steam per hour. Flow rate varied at will. Rugged. Easily installed. Readily understood. Wherever there is pressure drop in any process work the Campbell is applicable.

FILL IN, TEAR OFF, AND MAIL

The Campbell Engineering Co.
Industrial Office Building,
NEWARK, N. J.

Manufacturers of the TAR BABY BURNER, to handle Fuel Oils, Water Gas Tar, Acid Sludge, and Residue Fuels.

Without obligating us in any way, please send information on ( ) the Watermelon Type of Control, ( ) the Pumpkin Seed Type, ( ) the Tar Baby Oil Burner.

Name .....

Firm .....

Address .....

.....

33.8 per cent. of unsaturated hydrocarbons. It was passed over calcium chloride, over wood charcoal to remove higher homologs of thylene, and through an absorption tube kept at 40 degrees and containing glass beads or glass wool, in which a stream of 1 per cent. solution of silver sulfate in 94 per cent sulfuric acid absorbed the ethylene. The ethyl-sulfuric acid obtained was decomposed with water and then alcohol distilled off, 33.82 grams of alcohol being obtained from 300 liters of gas. When the gas has not been previously freed from the higher olefins the yield of alcohol is practically the same, and an oil insoluble in water is also obtained. The gas freed from ethylene burns without smoke.

Natural Gas and Gasoline Industry

The Carburetion of Combustible Gas with Butane and Propane-Butane Mixtures with Particular Reference to the Carburetion of Water Gas. Odell. (*Bureau of Mines, Reports of Investigations No.* 2840; *C. A., Vol.* 22, *No.* 6, *p.* 1034.) Plant experiments were made on the enrichment of blue water gas with "G. E." gasoline (Phillips Petroleum Company.) The product was added to warm blue gas at the outlet of the relief holder before the exhauster, 9.2 per cent. being used to make 565 B.t.u. gas (0.78 to 0.82 specific gravity.) The gasoline was withdrawn from the tank car under its own pressure (35 pounds.) It consisted of normal and iso-butane, with about 5 per cent. propane and 2 per cent pentane, 0.5 grains of hydrogen sulfide per cubic foot. No condensation in the distributing system was noticed. The amount of blue gas to be made is about 10 per cent. larger on account of the smaller volume of the enriching gases required as compared with oil-gas enrichment. Tables are given for the calculation of the amounts of gasoline required.

Production and Composition of Decolorizing Carbons. Honig. (*Chem. Ztg.*, 52, 7, 34 (1928.) *B. C. A.-B. Mar* 16, 1928, *p.* 177.) The methods of production of the four main classes of absorbent carbons are: (A) carbonization of raw materials derived from plants, e.g., Bragg's charcoal, Carbox, Suchar, etc.; (B) the action of activating or inflammable gases at a high temperature on carbonized materials, e.g., Norit, Eponit, Supranorit; (C) carbonization of raw materials mixed with carbonate of calcium or magnesium, e.g., Darco; (D) dehydration of raw materials such as carbonhydrates with zinc chloride, e.g., Carboraffin. The products usually contain varying amounts of moisture, ash and hydrogen, with traces of sulfur and nitrogen. Those of class (B) are richest in carbon, Supranorit containing 98.2 per cent., whilst their absorptive power varies inversely as the hydrogen content. In Darco the lime and magnesia are firmly combined and cannot be removed by washing with acid. Carboraffin may be regarded as a dehydrated hydrocarbon in colloidal dispersion, which is practically insoluble and owes its absorptive power to its highly unsaturated character.

Symposium on Determination of Unsaturated Hydrocarbons. (*J. I. P. T.*, 12, 32 (1926). *B. C. A.-B, May* 28, 1926, *p.* 395.) Brame suggested the use of 83.5 per cent sulfuric acid for removing and polymerizing unsaturated compounds.

Dunstan pointed out that it is probably incorrect to assume that iodine values refer exclusively to unsaturated compounds.

Lomax and Pemberton showed that treatment with 80 per cent. sulfuric acid does not serve to remove olefins completely and advised distilling the spirits in separate fractions before treating.

Moore described experiments, using various strengths of sulfuric acid from 80 to 95 per cent. and stated that unsaturated compounds were not removed completely enough with an acid weaker than 90 per cent. A rise in the aniline test of 1 degree corresponded to a loss by acid absorption of 2.59 per cent. of unsaturates.

Garner stated that under certain conditions combination takes place between unsaturates and aromatics in the presence of 93 per cent. sulfuric acid.

Results of Research and Investigationad Work

Polymerization and Depolymerization of Amylenes Under the Influence of Silicates. Lebedev and Vinogradov-Volzynski. (*J. Russ Phys. Chem. Soc.*, 60, 441-452, 1928. *B. C. A.-A., July*, 1928, *p.* 732.) A mixture of amylenes, consisting of trimethylethylene and methylethylethylene, yielded when heated with floridin (a silicate activated by heating at 300 to 350 degrees) diamylene, b.p. 37 to 39 degrees. This product when heated at 150 to 150 degrees with floridin yielded gaseous and liquid products. The former consists of 8.25 per cent. of methane and 91.4 per cent. of a mixture of iso- and psi-butylenes, with possibly traces of propylene. The liquid products consisted of isopropylethylene, isopentane, trimetheylethylene, a gamma-methyl pentene, b.p. 67 to 69 degrees, heptylene, octylene, and nonylene.

Transformation of Alcohols into Gasoline. Mailhe. (*J. usines gaz* 52, 2-3 (1928); *C. A., Vol.* 22, *No.* 7, *p.* 1231.) Vapors of alcohols (for example, ethyl, propyl or butyl alcohol) passed over uranous oxide at 420 to 440 degrees C. yield, per 100 cc., three to four liters of gas, about 50 per cent. hydrocarbons and a condensate consisting of a mixture of about 40 per cent. paraffins and 60 per cent. olefins, in the gasoline range, after washing out the aldehydes and alcohols. Liquids are also condensed out of the gas by means of solid carbon dioxide or activated carbon. The hydrocarbons are believed to be formed by the splitting off of a carbonyl residue from the crotonic condensation products of the aldehydes formed by the dehydrogenation of the alcohols.

Phenols from Natural Petroleum. Tanaka and Kobayashi (*J. Faculty Eng. Tokylo Imp. Univ.* 17, 127-33 (1927). *C. A. Vol.* 22, *No.* 6, *p.* 1032.) The phenols, together with naphthenic acids were extracted by saponification with caustic soda. This was followed by acidification. The phenols were separated by neutralization with the

calculated amount of potassium hydroxide corresponding to the actual value, the resulting soap solution being treated with ether. The phenols having smaller dissociation constants than the naphthenic acids, remained in the free state, and consequently were extracted by the ether. Analysis of the phenols showed approximately 50 per cent. *p* - cresol, 20 per cent. *m* - cresol, 15 per cent. *o* - cresol, 4 per cent 2, 4-xylenol, the balance being 2, 3-xylenol, diethylphenol and triethylphenol.

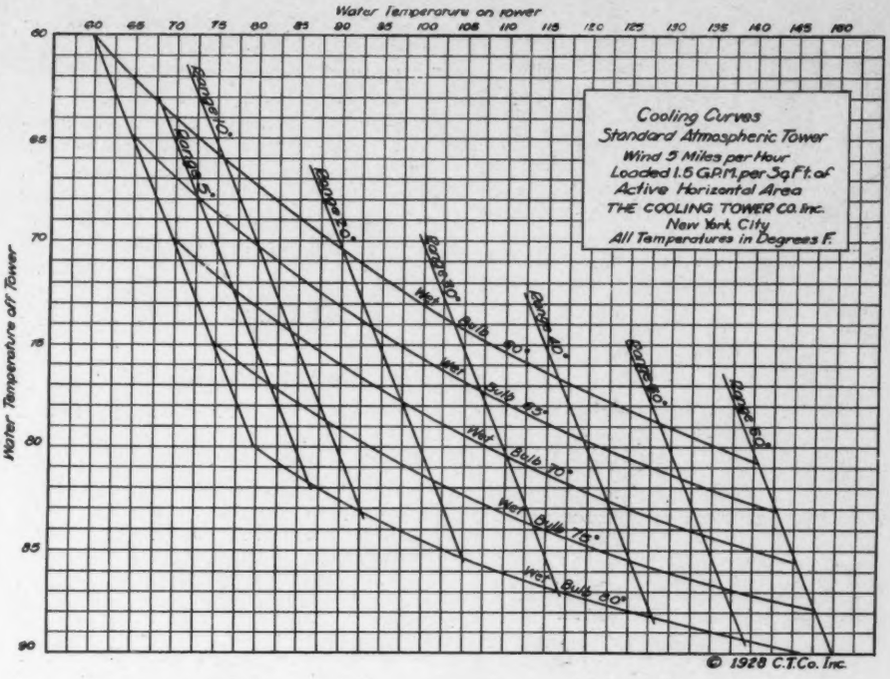
Judging the Knock-Stability of Hydrocarbons. Butkow (*Erdol u. Teer* 4. 162-3 (1928). *C. A., Vol.* 22, *No.* 11, *p.* 2050.) Investigation of the sensitiveness to oxidation, by heating with oxygen under three atmospheres at 230 degrees C., of heptane (typically knocking) and toluene (non-knocking) showed that this is a measure of their tendency to knock. *B*-Naphthylamine and aniline, known as anti-knock agents, check the oxidation of heptane. Addition of toluene to aviation gasoline reduces the latter's sensitiveness to oxidation.

Effect of Anti-Knock Compounds on the Adiabatic Ignition of Hydrocarbons. Aubert, Pignot and Villey. (*Compt. rend.* 185, 1111-3 (1927). *C. A. Vol.* 22, *No.* 5, *p.* 863.) The temperature of adiabatic ignition of cyclohexane is only slightly raised by the addition of large amounts (up to 10 per cent.) of tetra-ethyl lead. The effect is in the opposite direction on C_6H_{14} and C_7H_{16}. Concentrations of tetra-ethyl lead of the order of magnitude of those used in anti-knock fuels (0.1 per cent.) are without effect. This shows either that the liquid droplets present in gasoline-air mixtures play an important part in the reaction that the adiabatic compression created by detonation is set up extremely rapidly, or that the dope affects the reaction only after ignition.

The Ideal Efficiency of Internal Combustion Engines. David. (*Gas J.* 179, 695 1927). *C. A., Nov.* 20, 1927, *p.* 4050.) Specific heat and dissociation values ordinarily used in calculating the ideal possible efficiencies of internal-combustion engines are too high and consequently ideal efficiencies are too low. Experiments have been made with pure gases (mainly carbon monoxide and hydrogen mixtures) by optical indicating and flame photography. On explosion, chemical equilibrium is far from being attained at maximum pressure, contrary to usual assumption of complete combustion used in calculating specific heats.

Engine and Car Performance, James. (*J. S. A. E., Vol.* 22, *No.* 1, *Jan.*, 1828 *and* (*discussion*) *pp.* 101-105.) Acceleration, hill-climbing ability and maximum speed considered; size and speed of engine, compression ratio and weight of car; assumptions made and their algebric expressions; can gain standard performance in various ways; high compression wanted despite premium fuels; changed torque peak without changing timing; uneven distribution reduces knock tendency; where oil industry is remiss.

Examination of Lubricating Oils after Use in Automobile Engines. Rosewarne. (*Can. Dept. Mines, Mines Branch No.*


Water Temperature on Tower
60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150
Water Temperature off Tower
60 65 70 75 80 85 90
Range 10°
Range 5°
Range 20°
Range 10°
Range 5°
Wet Bulb 90°
Wet Bulb 85°
Wet Bulb 70°
Wet Bulb 75°
Wet Bulb 80°
Cooling Curves
Standard Atmospheric Tower
Wind 5 Miles per Hour
Loaded 1.5 G.P.M. per Sq. Ft. of
Active Horizontal Area
THE COOLING TOWER CO. Inc.
New York City
All Temperatures in Degrees F.
© 1928 C.T.Co. Inc.

These Cooling Curves are Based on 20 Years of Experience

REGARDLESS of competitive cooling claims, the above curves are based on our 20 years of experience in the cooling tower field. They show you what results you can expect from properly designed atmospheric cooling towers, loaded 1½ gallons per minute per square foot of active horizontal area. A higher loading than this will result in poorer cooling results.

In many cases, a correctly designed cooling tower or a spray pond system will return its entire cost during the first year or two. With responsible firms we are ready and willing to enter into an agreement whereby the cost of the equipment is spread over one year or more, so that the payments can be made out of the savings effected. Our nearest representative will be very glad to explain this plan to you in detail.

THE COOLING TOWER COMPANY, INC.

15 John Street — **New York**

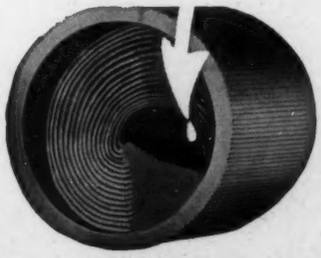
Houston, Texas
The J. A. Rossiter Co.,
410 Union Nat'l Bank Bldg.

Tulsa, Okla.
N. M. Muir,
Kennedy Bldg.

Los Angeles, Calif.
N. O. Fleming Co.,
5815 Maywood Ave.,
Huntingdon Park

Representatives in other Principal Cities

The Spiral Motion Is the Trick



That's why Hood's Chemico Spiral Packing Rings have been selected by so many engineers. The center hole prevents choking and clogging.

Made of acid-resisting shale—practically indestructible.

Used by all big producers because of the intensive movements.

Samples on request

B. MIFFLIN HOOD CO., DAISY, TENN.

671, 137-57 (1927). *C. A., Vol. 22, No. 2, p.* 314.) Forty-seven samples of oil representing about ten commercial brands were analyzed before and after test runs in the automobile engine. The figures determined were specific gravity at 16 degrees C., viscosity at 38 degrees C., flash point, carbon residue and per cent. dilution. The significance of each of these factors is discussed. Unused, used and reclaimed oils were compared. The analytical figures are assembled in 14 tables. This work is regarded as preliminary to a more thorough study.

Care of Diesel Engine Valves. Ingham. (*Gas and Oil Power, Vol.* 23, *No.* 265, *Oct.* 6, 1927, *p.* 1.) Safe and satisfactory running of Diesel engines depends in large measure on their careful maintenance; importance of perfect adjustment and condition of fuel valve.

Data on Anti-Freezing Solutions. (*J. S. A. E., Vol.* 22, *No.* 1, *Jan.* 1928, *p.* 40.) Latest information from Bureau of Standards; ready-reference anti-freezing solution tables based on Letter Circular No. 28 of Bureau of Standards and showing percentage by volume, quantity, pints per gallon of water, specific gravity at 60 degrees F.; table giving practical directions for preparing 1 gallon solution of denatured alcohol, distilled glycerine and ethylene glycol.

NEW PRODUCTS

Production of Contact Substances from the Solar Oil of Grosney. Tilitschejew and Dumskaja. (*Petroleumind. russ: Neftjanoe Chozjajstwo,* 11, 738, 1926.) *Chem. Zentr.*, 98, *I* BCRJ AVTBGQ. *Libr. Bull. U. O. P. Co., Vol.* 2, *No.* 34, *pps.* 286-87.) Sulfonic acids formed by the action of fuming sulfuric acid upon solar-or machine-oil distillates find technical use as catalyzers of the saponification of fats, in the condensation of phenols with formaldehyde, etc. Distillate previously dried and warmed to 50 to 60 degrees C. is shaken with 5 per cent. of oleum (containing 27 per cent. of SO_3). The acid layer with the resinous substances is run off the following day and the oil remaining behind is aerated and extracted with 3 per cent. by weight of 48 per cent. acid.

The authors examined the aqueous-alcohol extract containing the sulfonic acids and the oil obtained after the extraction in relation to the number of successive treatments in this manner: Petroleum distillates, 0.883-0.898 sp. gr., nD15 =1.49-1.50, viscosity Engler at 50 degrees 1.47-1.95, with 28.5-0.5 per cent going over below 300 degrees C., served as starting material. The acid number of the aqueous extract first rose and then dropped. In the first stages the increase of the acid number was accompanied by a decrease in the resinous substances in the acid layer. Obviously the oleum is first used to form resin and then to sulfonate. When the sulfonatable material is exhausted, the activity of the oleum ceases excepting less definite reactions which are manifested by the evolution of sulphur dioxide. The properties of the residue are scarcely altered by further treatment. It is lower in density, viscosity, refractive index and specific refraction, and has a higher aniline point than the original oil. It consists chiefly, perhaps, of naphthenes. Since the sulfonation chiefly affects the aromatics, the yield of contact substance is higher (13-22 per cent. of the original oil), the higher the density of the original oil. This yield requires 38 to 45 per cent. of oleum.

Stockham Pipe & Fittings Company, Birmingham, Alabama, has recently published a folder, which lists the number of pipe fittings of different sizes packed in a barrel, and which is prepared in a form allowing the information contained to be arranged in such a way as to be suitably placed at an office desk or on the wall of a shipping room. This handy folder will be supplied by the company upon request.

Soviet Buys Cracking Units

Then cracking units valued at $2,000,000, the first ever purchased in this country for the Soviet oil industry, have been ordered by the Amtorg Trading Corporation of New York, according to announcement by Saul G. Bron, chairman of the board of directors of the Amtorg.

"The cracking units will be installed at Batum and Taupse on the Black Sea, the terminals of the two new $30,000,000 pipe lines, and at Yaroslavl on the Volga River," stated Mr. Bron. "Several additional cracking units and pipe stills will be purchased in this country in the near future. The order for 10 units was placed on long term credit basis with the Graver Corporation of East Chicago, Indiana. In the past two years the Amtorg has purchased equipment for the Soviet oil fields to a total value of $8,000,000."

Professor Sakhanov and Mr. Fradkin, engineers of the Grozneft Oil Trust, have just arrived in the United States, to represent their organization in connection with the purchases of the units.

The Pure Oil Company is installing at its grease manufacturing plant at Marcus Hook, Pennsylvania, a number of large Patterson Jacketed Mixers for the manufacture of grease products.

Pioneers

IN THE
Development
of

FORGED
STEEL
FLANGES

MADE IN
HOUSTON

Boiler Flanges
Tank Flanges
Pipe Flanges
RIVETS
Boiler Tubes

HARRISBURG PIPE
& PIPE BENDING CO.
OF TEXAS
Sawyer and Winter Sts.
HOUSTON, TEXAS

C. H. Wheeler *of*

SURFACE CONDENSERS
JET CONDENSERS
BAROMETRIC CONDENSERS
OIL VAPOR CONDENSERS FOR
HIGH VACUUM
DISTILLATION
LEACH FRACTO CONDENSERS
AND HEAT EXCHANGERS
RADOJET AIR PUMPS FOR
VACUA UP TO 29.95 INCHES
FORCED AND NATURAL
DRAFT COOLING TOWERS

C. H. Wheeler Mfg. Co.
19th St., Lehigh and Sedgley Aves.
PHILADELPHIA

PHILADELPHIA